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ASTOUNDING
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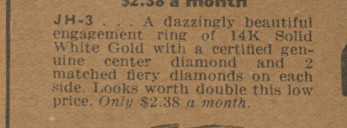

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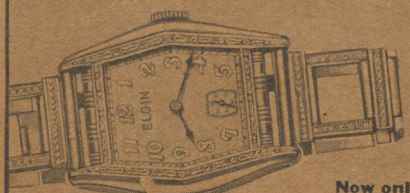

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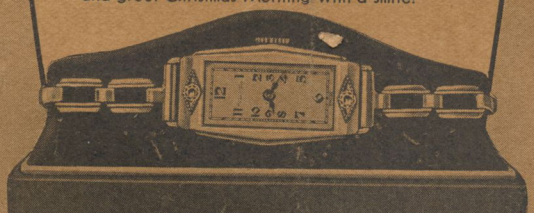

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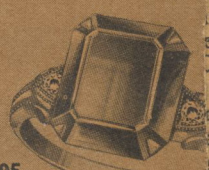

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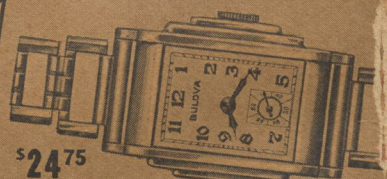

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VOLUME XIV
NUMBER 5

ASTOUNDING STORIES

JANUARY
1935

A STREET & SMITH PUBLICATION

Table of Contents

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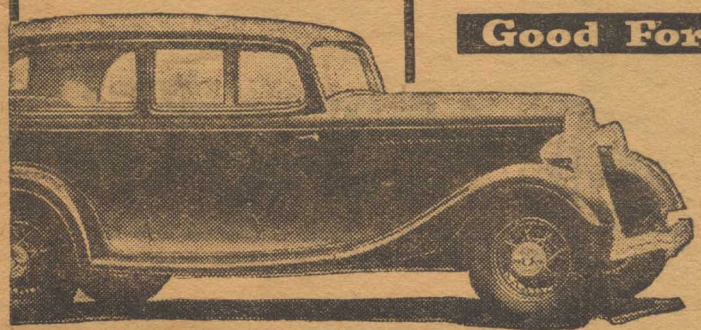

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31x5.25-21	3.25	1.15
28x5.50-18	3.25	1.15
29x5.50-19	3.35	1.15
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29x5.50-19	3.35	1.15
30x6.00-18	3.40	1.15
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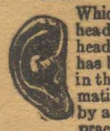

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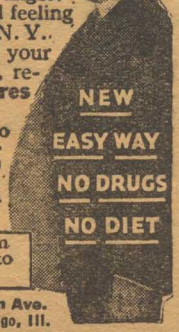

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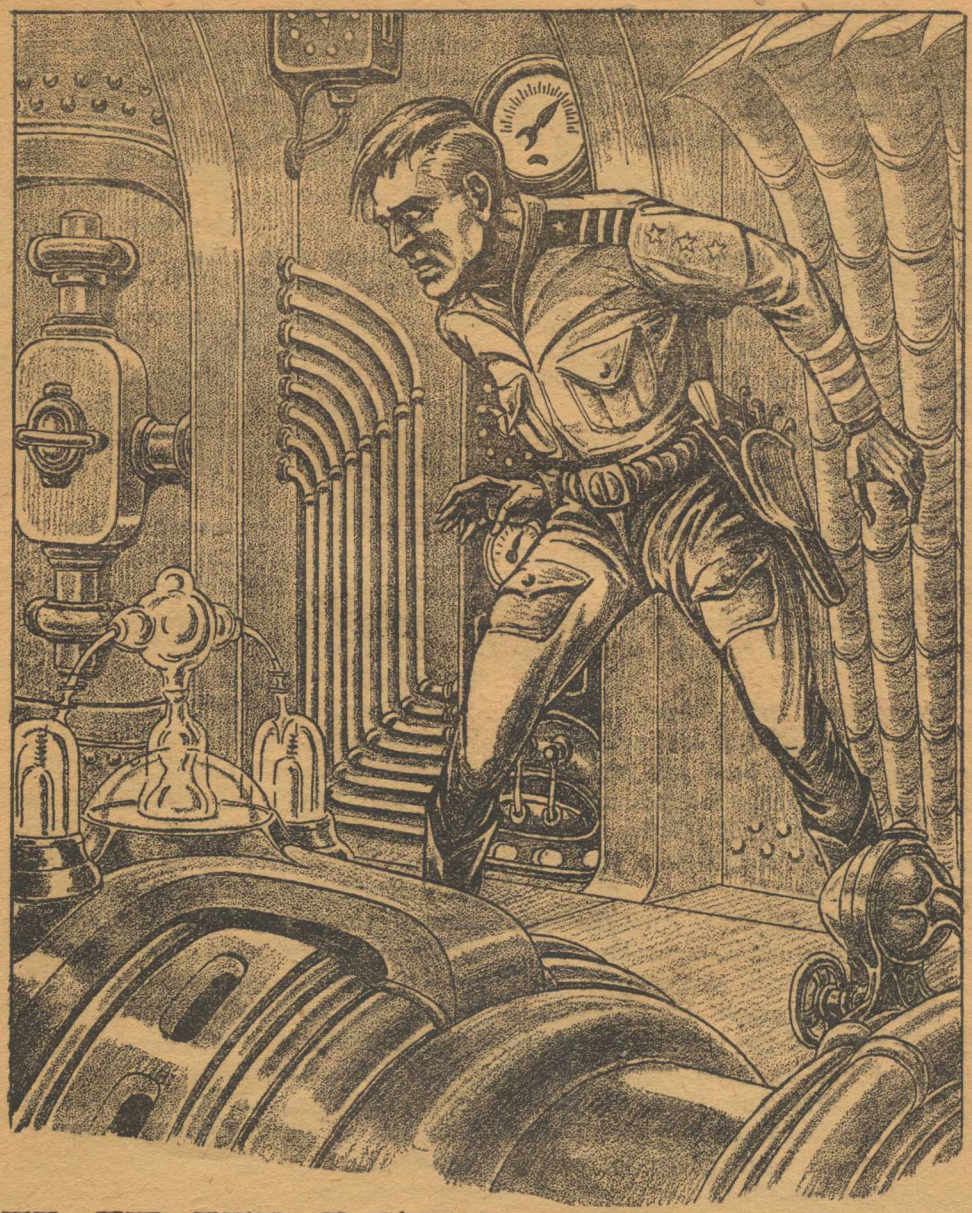
She paused and bent over him, slowly—and her eyes were shining.

STAR SHIP

A novelette of courage and fear, beauty and horror and pathos—evoked by the dread, unfathomable menace of the "sink hole of space."

by Frank K. Kelly



INVINCIBLE

Illustrated by Elliot Dold

HE HAD been sitting hunched on the high stool of the operator's chair, elbows on the smooth ledge of metal that encircled him, when the receptor tube spat a harsh sound in his ears, a sibilant warning note. He thought, "What now!" but straightened with alacrity, his stiff back shaping a tense angle.

He jerked his head upward in an arc, nostrils widened, his thin nose slightly trembling, as if he could smell what was vibrating through the receptor channel. He forgot how cold he was,

and how his stomach ached faintly from many days on a diet of compressed-food tablets, and how he wished his relief would come, because he was lonely, the universe seeming strange and hostile all around him.

He could see too many stars from this round room that bulged in a curve outward from the top of the Jupiter Dome. It was not good for a man to see too many stars too long.

The snapping sound cracked like a whip in his ears again, and a voice roared: "G-16, the Dome!"

"Jupiter Station," he said quietly. "G-16 responding. Graham at the key. Ready."

The hard voice rumbled: "Build for visual projection. S 1. Jan Garth will speak to you."

"Standing by," Graham said. "R tube clear. Projection coming—what channel?"

"A-channel," the voice boomed. "Beam Central, Earth, sending. Set up cross waves for head and shoulders. Use tight beam on a reverse arc."

"Power?" he asked faintly. "We're low here. The supply ship you were going to send——"

"All the power you've got," the voice cut in, brusque and commanding.

"Right," Graham muttered.

His hands, supple in metal-fabric gloves, caressed the complex panels in front of him as if he was playing a delicate musical instrument. He kicked a lever attached to one leg of his stool and the tripod chair began to revolve, slowly and smoothly.

As he turned he touched studs. The power tubes that ringed him in concentric rows hummed and howled, then went achingly silent, as the pulsating tight beam passed the wave band of audible reception.

His eardrums hurt: there had been a soundless concussion, and a golden sphere, slightly flattened at the ends, had come into being directly over his head. It hung suspended between the four great mirrors over him, spraying his face with lances of swirling light. He worked his lithe hands, fast.

A blue luminosity grew from his keyboard, spurted upward from the power tubes, forming like sapphire frost on levers and studs. Azure spears pushed at the glowing globe. His fingers danced over the power panels. The globe was held in balanced suspension in a basket network of crossing rays. It turned on an invisible axis, revolving with silent speed. Spinning like a dervish, the head and shoulders of a big man shaped within the hazy edges of the illuminated sphere.

Graham turned his twitching face upward. He whispered to himself, a little queerly: "Nice trick. You do it with mirrors."

He wanted to laugh—or cry. Sweat lay in heavy drops between his fingers. Visual projection always seemed like magic to him.

After all he was only a flabby little man who knew the motions, the incantations, that brought this magic into being. He handled forces he was terribly afraid of within himself. He was always wondering why the chained lightning in the tubes didn't turn and rend him; he thought some day it would refuse to perform its tricks, would swing and destroy him in a sudden burst of coldly coruscating flame.

The gleaming globe still whirled above him, but the spinning slowed, as he narrowed the flow of juice pouring into the A-channel. There were manacled giants in the tubes, but he could make them weak by starving them, by throttling the leaping flow of power that fed them.

The image in the sphere was at first vague and seemed to be upside down. Then the head and shoulders of the projected vision came right side around, the shape of face and neck clarifying first, then the line of lips and jaw slowly

sharpening and straightening. Presently Graham had no difficulty at all in recognizing the grim countenance of Jan Garth, Administrator of Star Lines.

"Jupiter supply ship left Mars this date, 12:40, Mars time reckoned in Earth units," Garth said abruptly. "Watched the blast-off through my v-plate here. Record the time for permanent preservation."

"Recorded," Graham said, very low. He had taken it on the absorbent tape.

As soon as adequate projection had been built up, he had switched in the recording spool.

GARTH didn't say anything for half a minute after that terse exchange of crisp phrases. It was the first time the administrator had used the Jupiter beam personally, and for an instant the harsh voice stumbled, as if the man speaking had suddenly been brought up against reality in his mind; as if he had just awakened to what he was really doing.

He was talking—no; an image of himself was talking—in a little room high up under the roof of the interplanetary dome on Jupiter, a room separate from where he stood on Earth by an immensity so vast that the thought of it stunned a man into somber silence.

At last Garth said: "The ship is one of ours. Registered at the Port of Korna, nine thousand tons Earth weight; carrying pilot, navigator, and twenty-eight passengers. The *Star Ship Invincible*. Captain Moran commanding."

"New ship," Graham said succinctly.

"Maiden voyage. It's the first of the new fleet."

"Carrying supplies for the Dome here?"

"Yes."

"We need plenty," Graham said, biting his words.

He shivered, suddenly realizing that he was very cold. Jupiter's atmosphere didn't hold heat; the Sun was very far away; and they had only a little more fuel to feed into the atomic converters. Until the supply ship came, the Dome would be cold.

"I know," Garth said.

"Why did you wait so long to send this ship?" Graham demanded recklessly.

He forgot the power of the other; he forgot that he was only Key Man G-16, Jupiter Station; he thought of how they had to live, here in the Dome, sleeping restlessly in chilly cells, groping through corridors kept dim because light took power and you didn't mind not seeing very well if you could stay at least partly warm. And always the faint ache in their bellies; the ache that came from month after month on the same diet of compressed synthe-food.

Garth said: "This is only a little later than usual. The ship will be there soon. Hold hard."

Graham hunched his shoulders. "You —you haven't forgotten the Sink Hole?"

Garth said: "No."

"The ship's carrying passengers?"

"Yes. Twenty-eight."

"They've been warned?"

"They've been warned."

Graham nodded. "Well, Moran and his navigator know what to expect."

"They're not going to have any trouble."

"You're pretty sure," Graham said softly. "This ship—she's fast?"

The big man shifted his head, raising it with exultance. "I told you; it's the first of the new fleet we've been building on Mars for the Jupiter run. Since the Sink Hole came, we've been working night and day. Now we're ready to take a chance."

The little man sat still, his body humped, feeling the sweat gather in the cold palms of his hands. They were taking a chance, were they? This new ship must be big stuff; at least the lab men thought it was big stuff.

A picture rose in his brain. He glimpsed strained faces, looked into the worried yet courageous eyes of the

passengers—passengers who were, he knew, friends and lovers of the people already here in the Dome. They know what might happen, those passengers; yet they went aboard the *Star Ship Invincible* because the touch of a friendly hand, the pressure of lips and bodies in the physical contact of love, meant more to them than living a safe existence full of the emptiness of fading memories.

They were coming unafraid, risking everything, knowing that the Sink Hole might never close again; because it had closed once before, after an interval of ten yawning years, was no guarantee that it would close now after this reopening. They came, knowing they might be put away forever from the good Earth.

They weren't willing to be cut off from the outer planets for ten years, waiting for the Sink Hole to shut together in its periodic pulsation. Ten years was a long time; too long, these faithful ones believed, too long for separation. So they risked more than life for——

"You're not taking the big chance," Graham said after a minute. "Those people aboard the *Invincible* are doing that."

Garth shrugged. "People are always taking chances. That's life, isn't it—taking chances?"

Graham said: "I don't know. Maybe it is."

"They've got everything in their favor," Garth stated. "The Walton Arc is still clear. The Hole's widening slowly this time. And the ship has the speed to make port at the Dome, before the Hole spreads across the Walton Arc."

"I hope you're right," Graham muttered.

All at once a realization came to him, and he went cold in every part of his body. He thought: God, she may have decided to come this trip. Even now she may be on the *Invincible*, not knowing the danger, not sensing fully that the ship rides a race with death. The passenger list—the names of those who were coming on the *Invincible*. He had to know.

He tried to keep the shivering out of his voice, but it was there when he spoke: "You—you'd better let me have the names of the passengers, chief. The people here will want to know who's aboard that ship."

Garth looked at him closely. "All right; I'll give it to you. I've got the record here. Better take this on the tape."

"Yes, sir," Graham said, very low. "The names, sir?"

Garth's hand appeared in the projection, holding a strip of metal-fabric, stamped indelibly with a string of names and numbers; he began to read, his voice low, his eyes now and then glancing at the signal man's face; since the projection had been built on a tight beam operating along a double arc, Graham's body was visible to the man on Earth.

THE LIST wasn't long; only twenty-eight passengers. Almost the last in the roll was the name Graham had hoped and feared might be there. There couldn't be any doubt now. The girl had gone aboard the *Invincible*. It all depended now on Moran—on Moran and whatever they had developed in the experimental laboratories on Mars. This ship—there was something about the way Garth spoke of it that gave him hope.

"I've got them all," Graham said, as the harsh voice of the administrator faded out. "Thank you, sir."

Garth stared at him keenly. "Any one you know listed there?"

The little man stammered something incoherent.

"Can't hear you," Garth said, indifferent now. For a moment he had been amused by the taut anxiety that had crept into the key man's gaunt face, but

after all it was nothing to him; he didn't care very much what answer the flabby fellow made.

"Only my wife," Graham said. He choked, and then went on: "Couldn't you tell me what this ship has that the others hadn't sir? And what—what do you want me to do? There must be something I can do. If I could help to keep her safe it would mean so much to me."

"I understand." Garth softened for an instant; really, the fellow was quite human, with his pleading eyes and twitching little face. "Yes; there's something you can do. You'll connect with the *Invincible* immediately after I've signed off here. Once you've got them, you'll transfer the channel on relay to my operator here, but keep your own key open. Moran is under orders to use the automatic time signal, on a circuit breaker operating every other minute. So long as you hear that signal, you'll know the ship's all right."

"Sure," Graham said. "But suppose it fades?"

"If you think something's wrong, you'll flash my operator and report."

"That's all I've got to do?"

"That's all."

"It's not much," Graham whispered.

Garth turned. "There isn't much we can do if the *Invincible* goes under. I can't believe it will go under."

"Yes," Graham said eagerly. "You said it had a lot of new gadgets. You couldn't—couldn't tell me what they were?"

"It's the best ship we know how to build," Garth said slowly. "I'm not a lab man, so I don't know the jargon or the details, but it's got everything we could put into it. You needn't worry. Moran is the best pilot-commander we have, and Hansen's a navigator; they'll bring this ship through."

Graham shook his head, his lips trembling. "This thing won't be decided by navigating. It will depend on the ship —on speed, on power, on equipment."

Garth straightened, smiling a little. "Well, this vessel is named the *Invincible.*"

Graham shivered. "Wrong name. I'm afraid of names like that."

The other threw back his big head and laughed. "Have you got any sensible reason for being afraid?"

"Yes," Graham said.

The heavy-faced man looked at him, suddenly grave. "You'll explain."

"Sure!" Graham said. "I—I've had a lot of time to read the old books here in the station. I mean the old printed books the ancients had before the tape recorder and the film spool. There's a story of a ship of the sea that was built about two hundred years ago, in the twentieth century——"

"Go on," Garth ordered.

"It struck an iceberg—there were icebergs on Earth then; this was before climate control—and it went down. Right under, in just a little while. About a thousand people were drowned, counting the passengers."

Garth shrugged. "What's that got to do with the ship we built on Mars?"

"The experts said this ship of the sea wasn't sinkable," Graham said quietly. "Well, they were wrong. They seem to have found then that anything man could make could be easily destroyed. We've had to learn that lesson over and over."

After a silence Garth said: "What was the name of this sea ship?"

Graham answered: "They called it the *Titanic.*"

Neither of them moved for a while.

Then Garth shouted: "But you don't know this ship that Moran is commanding. It's made of an alloy, the newest alloy we've yet found; tungsten isotope and C-metal. The hull is split in cylindrical sections twenty feet in diameter over all. The sections are honeycombed with cells; the cells are bulkheaded, shock-proofed, deadened

with molecular insulation. The ship is armor-plated in three layers, with vacuum between each layer."

GRAHAM kept thinking of the girl; and not of the girl alone, but of all of them on the Invincible; crouching in a little metal bubble that hurtled at inconceivable speed along the Walton Arc, along a plotted curve that passed just beyond the edge of the Hole in Space. Just beyond—maybe. If the Hole didn't grow. And the Hole was growing.

His throat was bitter and dry. "It's no good if you've been preparing against collision. The Hole isn't solid, isn't material or tangible. What the ship's got to have is power—power to pull away."

"You think," Garth said slowly, "the Hole is something like a vortex or a whirlpool? And when a ship comes too near it's sucked under."

"Now you've got it," Graham said.

For a minute they both sat very still, staring at one another with opaque eyes; Graham could hear the sibilant singing of the discharge spark in the R tube behind him. He waited.

"The lab men have given the *Invincible* all the power we knew how to build into her," Garth muttered. "Etheric drive. If a ship's pulled into the Hole, it must come out somewhere. What's on the other side of the Hole?"

"We don't know," Graham said ironically. "I believe it lies in a universe of different dimensional proportions; in a different kind of ether. Somehow that universe, or maybe it was our universe, warped a little out of line, and there's this gap where nothing fits. It begins and ends nowhere."

The other whispered: "The lab men developed an experimental shield—waves generated in a circular blanket that will cover the *Invincible* all over. So the ship can ride in a static ether."

Graham put up his hands suddenly and covered his gray face. "I wish I could feel that you'd gone about this right; that the lab men knew what they were building; but I can't be sure. All I can think about is my wife. We'd only been married a little while when I was transferred here. I didn't want to bring her out to this God-forsaken planet.

"Then the Hole opened and stayed open, for ten years. I haven't seen her in ten years. But I haven't forgotten. She has been faithful. I know that. Now she's coming to me on a ship that's got a good chance of falling into hell. Maybe I'll never see her again. Maybe I'll never feel her lips against mine again——"

The big man's eyes were hard and unyielding. "You'll see her soon. Don't be a damned fool. You've got a job to do. You can't go soft on me now. None of us can afford to go soft in this game. I couldn't recall the *Invincible* if I wanted to. The ship's gone too far along the Arc."

"No; Moran wouldn't turn back now," Graham said harshly. "I know him, the devil. He's hard as hell. He's like you. You've never been hit like I'm hit now. But wait—it's coming to you. Some day it's coming to you."

Garth laughed; the sound throbbed with immense contempt. This flabby little key man with the face of a rabbit shouting at him, talking like that to him! That was funny. Yes. Damned funny! He roared:

"If I gave the order, even now, Moran would turn back."

Graham grinned, peeling his lips back. "He's after glory. If he went on and made it through, he could laugh at you. He'd be a hero the system over. And if he didn't—what'd be the difference?"

Garth was stung. "You've got your orders, G-16. If the circuit breaker on the *Invincible* stops, you'll ring me in at once."

"Yes," Graham said. "Whatever Moran does, I'll obey orders, chief. I've been obeying orders all my life."

Garth muttered grimly: "You're not after glory, are you?"

"No. Moran can have that."

Garth grinned. "Cut off."

"Cutting off."

The opalescent sphere lost shape and the illusion of solidity; it dissolved like smoke, streaming away in banners of golden glow that vanished in a bright and glittering nothingness. It was gone and Graham sat alone. The stars closed in around him; millions of white orbs watching him. To them he must have been a queer specimen of tormented matter, convulsed by the strange madness called life, wriggling frantically away from the final transfixion that would be his destiny.

Shuddering, he pulled his thoughts from the stars. Before, he had been lonely, but not this lonely; now he ached with the completeness of his isolation. His belly was empty, and his heart was vacant, except for the hunger of a terrible longing; yet these things were as nothing to him. He sat staring down the long slope of fruitless years, seeing before him the shadow of coming bereavement. He felt now that the girl, his wife, still lived somewhere in space; but the warm pulsation of her unique being was burning low. Far away from him she brushed elbows unawares with death. Annihilation was nearer to her than she knew.

His longing and his loneliness, however, were not stronger in him than the lifelong habit of submission to command. Swinging in the chair he began to change the set-up of the power chart.

II.

SHE STOOD at the foot of the burnished metal ladder that went up into the control cabin. Hesitantly, she caught her gleaming metal-fabric cloak about her and moved upward; halfway to the top she felt the ladder quiver under added weight, and, tilting her head, she saw a man coming rapidly down. He seemed to become conscious of her presence at the same time and stopped a little above her, staring.

He was a big man, the solid meat of his hard body revealed in muscular outline by the close fit of his space-man's uniform. Blond, burned by the light of suns and stars, he was handsome—an overpowering Nordic.

His lips twisted in a slow frown. "Do you feel the need of exercise, lady? I admit the ship's a little cramped back here, but still—climbing ladders——"

She stammered something. Looking at her more closely and seeing that she was beautiful, his lips twisted a different way and he smiled.

"Didn't you know it's not allowed to go up into the control cabin?"

"Oh, yes," she said lightly. "I knew it." She returned his smile.

He said with a stumbling voice: "You're lovely, but at least you're not a lovely liar."

"Why should I lie?" she asked slowly. "I wasn't doing anything wrong. I was exploring the ship."

"I see," he said, very sober. "First voyage?"

"Almost," she said. "Except for the crossing I made with my father from Earth to Mars. I have no memory of that. I'm Earth-born."

"So am I," he said gently. "Then we'd better be friends. There aren't many Earth-born on the ship."

She nodded. Her burnished golden head moved with an easy grace. Eyes the color of starlit space looked upward into his. She said quietly:

"I've found that. I've had no one to talk to for nearly three days now."

"Hard on a woman," he said, grinning.

She laughed, delightfully.

He moved another rung downward on the ladder. "You've been lonely," he said. "I'm very sorry. Didn't know any one like you had come aboard—this

trip. Should have looked at the passenger list more closely."

"You like me?" she whispered.

He put his head on one side, regarded her carefully, then answered, grave-voiced: "Yes. Definitely."

"I'm glad."

"All right," he said, with amusement. "Now, you like me?"

Her laughter tinkled. "Yes. Definitely."

He looked at her with a glow in his eyes. "I think," he said, "before this goes any further, we'd better get down from this ladder."

"I can't come up?"

"Persistent, aren't you?" he returned. "Sorry, but orders is orders, ma'am."

He laughed again. "Down with you, lady. Or have you a name?"

"I've a name," she said softly. "Tam. Tam Graham."

He felt a sudden keen pleasure in being alive. Three days of monotony, of watching charts and moving keys, hunched in a back-breaking crouch—three days full of overhanging terror were wiped away and he was glad he breathed and could see and smell and hear and taste. He tasted a word now, touching it tenderly with his tongue; the word was "Tam."

"Lovely," he said, without thinking. "It fits. So few people have the right names."

SHE dropped down the ladder in a swift sinuous motion, and he followed her, closed his arms suddenly around her, and kissed the fragrant rosebud of her mouth.

"Some day soon," he said softly, "I'll take you up in the control cabin—if you're very nice to me."

He held his arms in the same tight circle, but somehow she slipped easily from his hold, and he stood empty-handed and a little stunned.

Gravely her smooth voice came: "I've a husband somewhere. You may have heard of him. John Graham."

He dropped his hands, the smile fell away from his lips, and his face was covered by a shadow; before this, he had considered himself as not without honor. He was somehow ashamed.

"Yes. Jupiter key man."

"I love him," she said simply. "I'm going to him."

"You're brave," he said. And then: "I'm sorry."

"Forgiven and forgotten," she said, now smiling. "I want you to be a friend to me. You're a friend of John's, aren't you?"

"G-16?" he said. "Oh, yes! My name is Hansen. I'm navigator, in case you didn't know."

"I knew," the girl said.

They looked at one another and laughed together, but the sound of his mirth was strained.

"You're wise. Too wise for me."

"In some ways, perhaps. About ships and space you know things that I shall never know. You're a navigator—that's hard. I've heard John say it was hard."

"Ordinarily," he said, eyes darkening, "it's pretty soft stuff. But not for me this trip. I wish we'd left you back on Mars!"

"Why?" she asked slowly.

"You're taking a long chance. It's fifty-fifty we'll never make Jupiter."

"There's danger," she whispered. "I know."

He glanced at her with admiration. "You have no fear. If you were afraid, I'd feel it. I can feel things like that."

She said softly: "You see, whatever comes, I'll always have the memory of the night we left Mars. The lights crossing in the sky, like pale fingers pointing. The lines of silver ships, and then this ship, a polished cylinder, lying in that immense trestlework—what do you call that?"

"Slip cradle," he answered, looking at her with glinting eyes. "It's the same

with me. I remember every blast-off; even to the first trip I took as navigator, on the Mars-Earth run, five years ago. There's something about it."

"The thick Martian night," she said dreamily. "All those confused voices shouting. Monstrous machines and puny people. I'll never forget my first sight of those luminous letters on the side of this ship, stamped on the sleek curve of it: *Star Ship Invincible.*"

He nodded, his face strong with exultance. "*Invincible*—that's a proud name. Defiant!"

"Throwing back the light of the stars," Tam whispered. "As if to say—not afraid, not afraid, not afraid of what you can do to me. Not afraid of emptiness, of vastness, of the hard hostility written in the stars."

He shook his head. "The stars aren't hostile. They're indifferent."

"No," she said. "They hate us; I can sense it. They resent our arrogance, our impudence in voyaging out into the colossal sea of space where they have been so long alone."

He grinned. "They're only suns and planets; bright lights along the Broadway of the universe."

"Suns and planets," she repeated softly. "And beyond them?"

He shrugged. "More suns and planets, I suppose."

"Forever and forever?"

"Forever, perhaps," he said, laughing.

"Worlds without end," she whispered, and shivered a little. "I feel small and insignificant. We won't talk of those things."

"All right," he said.

THEY stood silent an instant, then he muttered:

"I suppose you've been all over the rest of the ship?"

"Yes," Tam answered. "I've been exploring. All those cold cells crowded with stellite drums and beryllium cylinders—they hold supplies?"

"That's it."

"For us? I didn't know we'd use so much."

He turned away from her, then swung back. "For us, and for the Dome on Jupiter. We'll use very little. This will be a short trip, if we make it. The ship has a new power source—etheric drive."

The girl looked at him soberly. "Now you talk of things incomprehensible to me. What is it, this etheric drive?"

"You remember your instructions space school concerning three-din sional calculations?" he asked. "We the drive is possible because we've gone back to the theory of an all-pervasive medium including the universe in its scope. By using a four-dimensional tesseract we are able to exert power directly on the ether.

"Think of the ether as a river in which we are completely immersed; by coming to the surface of the river we are able to ride a current and choose the direction of flow; the motions of the suns and planets are everlastingly stirring currents in the ether—ether drifts. They go in all directions, constantly crossing and recrossing one another. We've found a current Jupiter-bound, and we're riding it. All clear?"

The girl said, very low: "You mean, then, that at any time we may be hurled away from Jupiter instead of toward it if the drift changes direction?"

He frowned. "No. Naturally we've got a set of Donlin sun engines in reserve. And there's little chance of the direction of the ether flow changing. We can choose any drift we want and calculate its probable direction for twenty years to come. That is, we can do that by using the mechanical calculators. No man could think that fast—not even me. About all I do is feed the calculators problems. I think up the puzzles, they chew them up, and give me the predigested results."

The girl put one hand to her smooth

forehead. "You've given me an ache—here."

He glanced at the little chronometer strapped to one wrist. "Well, you're going to be rid of me now for a while. I've got to back-track to the C cabin. Came aft to take a stroll through this part of the ship and see how things were going. Moran will expect some kind of a report. What shall I give him?"

"Tell him," the girl said, "all's well!"

"In more ways than one," Hansen muttered.

His mouth still burned with remembrance of that swift kiss. He was yet stunned with the knowledge that this was the wife of John Graham—this girl married to the flabby little key-man who had been for ten years marooned in the Dome. It wasn't easy to believe, because he didn't want to believe it.

The girl touched his arm timidly. "You'll come back again and talk to me?"

"Sure," Hansen said, slow-voiced. "Sure, I'll come back again. And maybe—I don't know, because Moran's a pretty sour old space-buster, but maybe, I say, I'll be able to take you up in the C cabin. I'll come again as soon as I can."

He made an exaggerated bow, kissed her hand, then smilingly turned away and vanished up the ladder. After he had gone, the girl raised her fingers and slowly rubbed them across her lips.

She went back slowly to the little cell in the ship's hull that had been given to her. It was no better, no worse, than the accommodations offered the other passengers. It was cramped and cold, but it was clean, almost Spartan in its austerity.

There was a wide bed, nearly level with the floor, the smooth silky surface of it shining softly. She sank down in the soft stuff, felt the warm fabric close around her, hold her in a firm yet tender embrace. She was tired, with a weariness arising from monotony, yet no desire for sleep came to her.

She was lying very still, half dreaming, half waking, and it seemed only a part of the dream when a spot of yellow light appeared on the wall and a voice spoke to her with exultant eagerness:

"Tam, I've found you!"

THIS was not dreaming. It was real. Too real. With a little gasp she answered, speaking wildly into the cone of saffron light that thickened and strengthened while she spoke:

"John—you can see me?"

His voice came, brokenly, the voice of a man given a rare vision: "Yes; I can see you. And you're beautiful. You're more beautiful than you were so long ago. The years have not changed you, nor time altered you, except to make you more wonderful."

She couldn't move, but her body shivered in a kind of ecstasy.

"This is like magic; like a miracle. John, where are you?"

"The Dome," he said faintly. "Jupiter."

"Let me see you," she said. "Darling, let me see you."

He didn't answer at once. Then: "This beam—works only one way. Hard to keep it narrowed on your cabin. No receiver at your end, no transmitter. Can't build a reverse arc."

She said softly: "It isn't possible?"

"No. It isn't possible."

She thought he seemed glad. That was strange. Yet it might have been only her imagining. She whispered:

"You've changed a little. Your voice is different."

He said: "Darling, I'm still the same, and you're still the same, and our love is as it has always been. And it will be the same through life everlasting."

"Ten years," she whispered. "A long time, John."

"Then you mean—well, I don't de-

serve you. And no woman could be faithful through ten years."

"But I have been faithful," she answered simply.

He would remember those words all his days.

"The ship," he said, after a silence. "Everything's all right?"

"Yes. In a little while I'll be with you."

His voice shook. "Darling, I can't wait. My arms have been empty so long."

"We waited ten years," she whispered softly. "The years are gone, and we shall not remember them. We have the hours that remain to us."

The shaft of vibrant light quivered and died away, leaving the room full of shadow and the echo of his exultant voice:

"Tam, you're coming to me!"

"Only a little longer," the girl cried to him. "Only a little longer, darling."

The light was gone and somehow a shadow lay over her heart. She had a sudden remembrance of the cold hostility she had seen written in the stars; and the ship still rode the sea of space.

III.

HANSEN climbed the ladder into the control cube, feeling like an old man. His joints were stiff and bitterness was in his mouth. All his life he had waited for a woman like the one he had seen below; his eyes had been warmed by the vision of her, and the warmth had gone through his body, lighting torches in his veins. Now that flame was dead, abruptly quenched, and he was blinded by the pain of his spent longing.

He reached the end of the ladder and pulled himself up into the crowded room that had been his whole world during many hours of tense labor. His legs shook under him.

Captain Moran was standing in the middle of the cabin, looking at him.

"You've come back so soon?" Moran asked. "Why didn't you do as I said —take an empty cabin aft and sleep a while? You're very tired. So am I—but not so weary as you seem. Your face shows that, sir."

"Does it?" Hansen mumbled.

He rubbed an elbow against a slot in the wall and felt the smooth round surface of a sealing plug slip into place behind him. He stood an instant with his back against that cool metal stuff, unsmiling, his eyes on the dull gray of the floor.

"I can't sleep back there—with them."

Moran's lips tightened. "You mean, you're afraid the thing we're hoping won't happen, may happen, and you'd be caught with the passengers?"

"Hell, no!" Hansen said, his voice savage. "I'd rather take my place with them than carry this knowledge around with me. They don't know they're doomed. When the thing happens to them, it will be sudden, sharp, complete, like an execution. They haven't been turning the possibility over and over in their minds, fighting the thought of it, then letting the thought sweep in and grow and grow, until it's like a monster devouring a man's thought-stuff. You and I have the joy of that."

Moran came closer to him, walking with tight, clipped steps. The captain put a hand on his shoulder.

"Nothing's gone wrong yet, Hansen. You're borrowing trouble."

Hansen's eyes flamed up at him. "Am I? Am I? So it hasn't been worrying you, eh? It hasn't been worrying you that we've the lives of twenty-eight people in our hands; that maybe we've got to let those twenty-eight people die, because we have our orders, and we obey—damned fools, we do what we're told, even when it comes to murder."

The older man didn't move for a minute. The hard, quiet face remained with that curious surface stillness all over it, the mask that had never fallen

before Hansen or any other so far as he knew. Then Moran said:

"This isn't murder. They were warned, over and over. They came freely, knowing the chance they took. You and I would be glad to die with them. But we've got a different part to play—a harder part, maybe. I don't know about that. We're men. We'll behave as men."

Hansen straightened. He no longer needed the support of the cold metal slab against his back.

"Hell, you're right! But I—I've seen a woman; not an ordinary woman—she knocked me a little off balance. She seemed to me too beautiful to die. I wanted to save her. I couldn't breathe straight for a little while."

"Some women can do that to you," Moran said, understanding. "You've never taken a wife, have you? And it has come to you that this is the woman for whom you have waited."

"I know it," Hansen said very softly. "But it just couldn't be arranged. She's Tam Graham, G-16's wife, and she happens to love him."

Moran's eyes flickered. "Johnny Graham's wife! On this ship! I remember her. She is—beautiful. I can't forget the way he used to look at her. There's something between them like—like adoration. If anything happens to——"

"Yes," Hansen said. "No good thinking about it. We can't do anything for her. She's only one among many. There are other women riding with us—maybe not so beautiful physically, but beautiful with the same kind of love. It's the same with them as with Tam. It must be the same with them, or they wouldn't have taken this ship. They came with their eyes open. We can't save them all."

"No," Moran said. "You and I didn't make the Hole. We've got our job to do, and we'll do it, the best way we know how. The rest is on the knees of the gods."

Hansen nodded slowly. "Have you checked the chart since I left?"

"Twice," Moran said. "Speed's holding. We're on our course. We've got a good chance of pulling away clean."

THEY went over to the Danler spacial chart and stood staring at it together. A black smear, twisted like a snake, cutting across the smooth ivory luminosity of the board—that was the Sink Hole.

Swinging across the upper end of that ebony blur they could trace the faint red line of the Walton Arc. A green sliver of glow was the *Invincible;* the ship crawled deliberately, it seemed to them, along the scarlet curve. As it crawled, it came nearer and nearer the blob of unfolding darkness that was the Hole. It seemed as though some one had spilled ink on the white surface of the chart, and the ink was spreading, spreading——

Moran said: "We're doing better than Garth figured. I've balanced the chronometer readings with space-path calculations and made allowances for light distortions due to etheric faults, but still our speed is pretty nearly inconceivable."

"And if anything happens," Hansen said quietly, "we've still a trick in reserve. I don't understand how it's going to be done, but Garth gave you the directions."

"Listen," Moran said impatiently, "I explained it to you once. It's not simple, but you're a navigator with AA rating and dimensional mechanics should be understandable to you. Garth and the lab men believe the Hole is a dimensional warp. Using the etheric drive won't keep us from being pulled into it, or through it, or across it, if a vortex has been formed by the spacial strain caused by the opening of that gap in the void.

"All the etheric currents may be

sucked one way, and we're riding an etheric current, you know. If the current we're on goes in the ship goes in. We're hoping against that. We're counting on the strength of the ether stream we're skimming now; we believe this flow will carry us by the Hole before it has fully widened across the Walton Arc. But we may be wrong."

Hansen grinned without mirth. "That's funny. You sound like an expert—'we *may* be wrong.' Hell, it's an odds-on chance the whole damned thing is cockeyed. I don't trust those lab men. Sure—they think up something like this, and then they stay where *they're* safe enough, but they send us space-wranglers out to try it on the dog. If it doesn't work right—that's too bad. Write it off. Unsuccessful experiment. They make a hell of a lot of unsuccessful experiments."

"That's the only way science gets anywhere," Moran said heavily. "Trying and trying and trying. This is a swell ship we've got here, isn't it? It's pretty comfortable, it's clean, it's warm, we've got as good air to breathe as you'll find on any planet, we've got speed and power to burn—not much like the old space boats that used to creep out to the Moon from Earth and then crawl back. There have been improvements; we owe them to the lab men. We owe a lot to the lab men. We've got to take our chances, sure, but they're doing the best they can to make things easier and safer for us.

"Most of them would rather lock the doors of the laboratories and never come out again; they've got what they think is the holy of holies, and the world, our world, the practical world, the world of men and money and machines, is just a damned nuisance to them. We're a lot of childish creatures always begging for new toys, new gadgets, new playthings. We build a civilization, then tear it down, building something different. We don't know what we want."

"I know what I want," Hansen muttered. His fingers twitched. "I want to get this damned ship safe into the Dome at Jupiter, and then I never want to see another damned space-buster again as long as I live. I'm sick of seeing stars; I've got a bellyful of monotony without end."

"You're tired," Moran said. "You've taken too long a trick at the controls. I've felt the same way; world-weariness born of physical weariness. Why don't you trust the automatic pilot when you're on duty? Machines are better than men —for most things."

Hansen swung around, his face contorted. "Damn you, you're not human! You'd rather look at the shine of a stellite stud than see a smile break on a woman's face. You're all wheels and levers and clicking cogs; sometimes I expect to hear a humming and buzzing come from inside you."

Moran laughed with metallic amusement. "I can depend on machines. When you need them, they're there. This ship is a machine. The thing that may save you and me from going in the Hole with the rest of them—that's a machine, too."

"I don't know," Hansen grunted, staring at it. "Maybe it is; sometimes I think it's alive. It's a damned funny-looking thing."

Moran looked across at the dimensional converter with a kind of loving reverence. Smiling, he said: "It's beautiful. Notice! Not a wheel anywhere. That's why you can't believe it is a machine."

THE CONVERTER was oddly like a flower—a flame flower with metal petals of vivid blue, and a purple cylindrical stalk luminous with an unceasing sweat of cold translucent bubbles that sifted out through a network of tiny apertures on the underside of the petals and flowed downward in a singing stream. It seemed to be covered

by a shimmering veil of something shining and smooth and transparent like glass, yet not glass.

Moran whispered: "Try to follow the lines of it with your eyes. You can't. They seem to begin and end nowhere. Yet they have beginnings and endings—not in our universe, not in our dimensional range, but somewhere; somewhere beyond or around or over or under our world. When I think that our laboratory men shaped that mechanism, prisoned free power in it, and gave control of that power to the little cube in the wall there, I'm proud. I'm glad I'm a man. We're only crawling scum maybe, lice infesting the surfaces of dying planets—but by Heaven, we've got a few brains."

Hanson shivered. "I don't like it."

The other laughed. "You're afraid of it, because it's so beautiful and terrible."

"Yes," Hansen said, "I am." Then: "Well, what does the damned thing do?"

"When the time comes that we have to use it," Moran said, "you'll see. I'm trying now to tell you how it works. They've called it a dimensional converter, and that's the right name for it. When I touch that cube in the wall, it will swing, and the angles of its planes one to another will be reversed, and the shape of this room and everything in this room, including your body and my body, will be converted across the dimensions—just for an instant, a fragment of a second, we shall be nowhere. We shall still be in this ship and at the same time we shall be in a million otherwheres.

"There is only one dimension—shape. When we talk about length and width and thickness and existence in relative time, we are only attempting to describe shape. And not even that—what we are really doing is describing size. Size is real, is physical, is solid and touchable. But shape—how can you get hold of that and describe it?

"Shape is the estimation of a thing that we form from the physical and mental impressions and perceptions, sensations and stimulations, that impinge on our receptive mechanisms. We know how a thing looks, but we can't describe it; we can describe some of its physical aspects, and make a few fumbling comparisons with other inadequately described things, and finally we conclude with the generality that everything is relative. This converter is like reality—beautifully incomplete."

"Still what you've said isn't clear to me," Hansen muttered, moving his hands protestingly. "I can't get all this straight in my head. Where the hell will we go when this thing starts working on us—and where will we arrive?"

"We'll come back as nearly as possible to where we were," Moran said, grave-voiced. "Maybe that will be somewhere within the shell of this ship—if the ship exists after passing through the Hole."

His cold glance swung to the spacial chart. The green blob had moved forward: nearly half of the red line had been eaten away, but the arc that remained was very near to the ebony blur of the dead spot. The Hole was widening like a hungry mouth——

Moran nodded toward the space-drive dial. He said, with a kind of savage confidence: "Speed still the same. Course all even. We're not going to have any trouble."

"No," Hansen said. "No; of course not." He looked at the gray metal of the floor. "But I think I'll sleep here. It'll be better if we don't unseal that plug again until we reach Jupiter."

"All right," Moran said, bending over the chart.

HANSEN stared at him; absorbed, intent on graphs and dial readings, he seemed indifferent to the existence of human weaknesses, human emotions. With him there could never be a great

love. And yet—it might be that he loved his machines with a cold intellectual passion.

Hansen couldn't help shivering. He was thinking of the girl; all that beauty obliterated, sucked into nothingness, destroyed by a devouring darkness. It couldn't be. He couldn't let it be.

Muttering a little to himself, he put his hot hands up to his head. Looking at Moran's stiff back, he whispered:

"I'm going to do something. I can't let her die without doing something. I can't——"

Moran swung. "Did you speak to me?"

"No," Hansen said in a mumble. "I didn't say anything."

"Thought I heard you talking."

Hansen grinned queerly. "Now you're getting the jitters. Maybe you got 'em from me."

Moran frowned. "You'd better take a little sleep while you've got the chance. I'll be needing some myself pretty soon and it'll be your trick again; you'll want to be in good shape, if you're not going to use the automatic pilot."

Hansen's face contorted; veins stretched in white tracery under the skin of his cheeks. "Listen, why don't you let me alone? Sure, I'll be in good shape. But let me worry about it, see? I'm sick as hell of your fussing and nagging."

"Sorry," Moran said, with a flush. "Nerves, I guess. Didn't realize how it must seem to you. All right; I'll let you sleep."

The other turned his back again. Hansen stretched himself out on the cool metal of the floor. The cabin was quiet, too quiet; he missed the hum and throb that would have been there if they'd been using the Donlin engines. This etheric drive was ghostly; no sound, no vibration, no crushing sense of acceleration when you were building power.

But he didn't trust it. Too many damned machines nowadays. Machines and more machines all the time. More machines than men pretty soon. Then what? That would be a hell of a fix, if the machines got bright ideas. Thank God, the devils in the dynamos couldn't think. Couldn't they, though? He didn't trust a machine, any kind of a machine. Didn't trust them——

A minute later Moran came over and stood looking down at the big blond body stretched on the floor. Hansen slept, restlessly, muttering, voicing stifled groans, rolling a little from side to side.

"A weak sister," Moran said with contempt. "A job like this and they give me a load like him to carry."

He raised his eyes upward, his glance passing through the transparent dome of the control room to touch the steely stars. He saluted them with a lifted fist.

"Hard, aren't you?" He grinned, showing small pointed white teeth. "Hard and secretive and stolid. You don't give yourself away. Me—I'm like you, and I'm glad. To hell with the weak sisters!"

The ship plunked, like a thrown knife, across the empty depths and vacant canyons that gaped between the shaky platforms of the winging worlds. Jupiter loomed close, a haven and a target, but still the Hole stretched like a black wound unfolding in dark flesh. The ship might yet be an unwilling lance forced to probe that wound.

Moran rocked on his two legs, defying and adoring the angry lights that broke the bleakness of those dark skies. Ebony infinity surrounded him, engulfed him, submerged him with a roar of mental surf, yet he remained a rounded entity, complete and unbroken as he had been since he had been cut as a flap from his mother's flesh, since he had emerged as a skein from her skein.

He was a man; he was unique. There were millions very like him, but they

were not as he was in all ways. This vision of the void smashed against his eyes, became a part of him, but he was not even now merged with this hungry immensity; like a blind amœba, the universe extended pseudopodia to take him, to absorb him, but he remained unsoftened and unabsorbed. He was a man; he was unique.

Suddenly he put his head back and laughed, freely and fully, without making any sound.

IV.

HANSEN, shivering, suddenly came awake. The shadow of a man's body was over his face; Moran had knelt close to him, was shaking him. He lay still for a minute, frowning, trying to think what it was that seemed so strange. Then he knew; the floor quivered under him, in ripples of rhythmic vibration. The Donlin engines were operating. That meant——

Moran, watching him closely, saw realization creep into the half-opened eyes.

Nodding, the captain said somberly: "I thought I'd better waken you. Though there's nothing you can do. Except wait."

Hansen stood up, not straight, because his shoulders slumped and he had the look of an old man again in his face. He groaned. "Why didn't you let me sleep? When I'm awake, I've got to think. I don't want to think."

Moran sneered: "Soft belly! You're afraid?"

"Yes," Hansen said. "Of myself."

He walked slowly over to the chart; when he saw what was mirrored there, he had no need for words. The green sliver of light had left the scarlet arc; slowly the blob of green glow slid toward the edge of the black smear. Hansen covered his face with his hands.

"No good," Moran said softly. "Dance to the music, friend. The ship's going under."

"How long have you known?" Hansen asked; his voice was tired.

"Just saw it now. Everything seemed to be all right until a minute ago. Then something slipped. I could feel it, as if the ship had lurched on one side. The dials didn't register a thing. No warning. But when I looked at the chart—I saw what you saw."

Hansen dropped his hands at his sides. "The Hole—how far away do you think it is?"

Moran thought an instant. Then: "About a million miles, I'd say." He was so cool, so calm, so indifferent; he didn't seem to feel anything at all.

Damn him, Hansen thought. But aloud: "Then we've got about an hour."

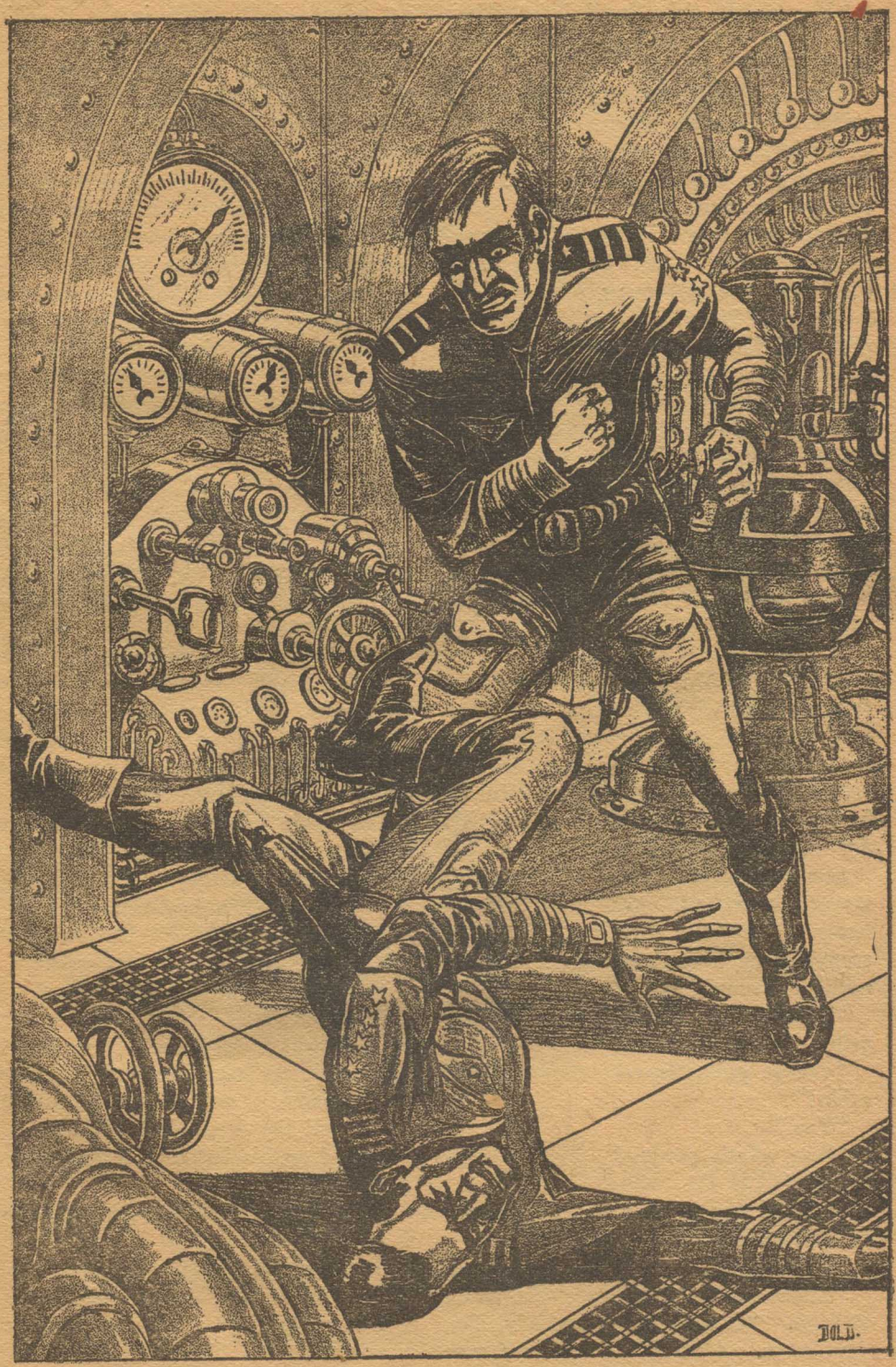
"That's it." Moran said pleasantly. "If we keep this speed. But we're accelerating, see. The Hole exerts a definite pull; that bears me out. I always thought it was a kind of vortex, which naturally would develop suction."

"Stop!" Hansen screamed. He was pale around the eyes. "I can't stand much of that. Save your damned drivel for a classroom lecture in space school when you're retired—if you think you'll ever see Korna-on-Mars again."

"I'll see it, all right," Moran said quietly. "So will you, if you hang onto your guts. All we've got to do is sit tight, and when the time comes, I'll turn the cube; we'll take our swing along the dimension line, swing back, and the Hole will be behind us, Jupiter dead ahead. Swell!"

Like a madman, Hansen leaped at him. Without preamble, without words, the navigator sprang. Moran, his mouth gaping in a face suddenly left vacant by complete astonishment, fell backward and went down. His head smacked the stellite flooring of the cabin, the angry glow went out behind his eyes, and his body stiffened to a dead weight in Hansen's frenzied grip.

Hansen laughed, looking at the lolling head, the limp body.



A red mist was swirling in his brain. He swung and watched the other go down.

"How's that, eh? Swell, huh! How does it feel to be dead, hard guy? How does it feel?"

Moran didn't answer, because he couldn't. Hansen jumped up, moving with a jerky nervous energy, and crossed the cabin to the seal in the wall. He touched a stud, the gimbaled plug dropped out, revealing the ladder seemingly stretching "down" but really going back into the passenger section. He looked over his shoulder; the automatic pilot held the controls, working smoothly and silently.

He scrambled along the ladder, his legs shaking. At the end of it, a long corridor opened, with numbered cells on either side. He stared at the closed doors blankly; he didn't know what cell she occupied. She hadn't told him, because he hadn't asked her. Before, he hadn't wanted to know; he had been afraid.

SUDDENLY a door a little distance from him slid into the wall and Tam Graham came into the corridor. She saw him; eyes lighting, she hurried toward him. She was as beautiful as he remembered. For her he had killed; for her he would kill again, if need be.

She came up to him. "Something strange happened," she began breathlessly. "Did you feel it? The ship seemed to go over on one side. There's nothing wrong?"

"Everything's wrong," he said, face grim. "Come with me."

"You're going to take me to the C cabin?"

"Yes."

"But what's wrong? What's happened?"

"I'll tell you when we get forward," he said swiftly. "Are you coming?"

"Of course!"

"Then hurry," he said, his voice strange. "I can't take anybody else, you know. After all, I couldn't save every one of them, could I? Couldn't get twenty-eight people in the C cabin, to begin with; silly to think of it. Though there'll be more room when we've thrown Moran out."

He pushed her ahead of him. Going along the ladder, she went first; he followed very closely, his breath puffing. When they were both inside the control room he turned and closed the seal. It seemed to take almost the last of his strength. The blood had been siphoned from his face; he was the color of paper. There was something wrong about his eyes; they didn't seem to focus.

"Here we are," he said. "All nice and cozy. You and I and a dead man."

IT WAS then, looking beyond him, that the girl saw Moran flattened against the floor. Calmly, she stepped a little closer to Hansen and lifted a cool hand gently to his hot face; she covered his eyes an instant.

"Rest a minute," she said soothingly. "You've been going too fast. Close your eyes. Think straight. Something has slipped away behind your eyes, but it will feel its way back, if you go carefully. Don't get excited."

She took her hand away. Hansen had shut his eyes and had been rocking on his heels, listening to the rhythm of her voice. When he opened his eyes, very slowly, the horrible brightness she had seen before was no longer there.

His eyes seemed a little vacant and washed-out; they looked curiously new, as if he was a child, without experience at all, without many memories, without the impressions and sensations that the years and the actualities of living had recorded on his brain. He said, stumbling with his words:

"Something important happened, but I can't remember what it was. Just a little while ago. Maybe if I take a little time to think, it will come back to me."

She walked past him and stopped, near the chart. She had no knowledge of these things, but the record written in

light was plain to read—the ship was slipping into the Hole. Now the meaning of Hansen's queer flood of words was clear to her. They were doomed, and Hansen hadn't been able to face the fact. But he had thought of her, and he had come to her with the purpose of somehow protecting her against the death that loomed for them all; he had wanted to save her.

But Moran—his silence, his immobility, the crumpled position of his body, the thin trickle of scarlet flowing from his head—that didn't seem to fit in. She knelt, held the captain's head in her lap, wiped away the blood; there wasn't much blood, but the blue bruise at the back of the skull was very ugly. Still he wasn't dead, or dying, and Hansen had spoken of a dead man.

"Is this the man you meant?" she asked softly, looking across at the navigator.

Hansen still stood like a sleeper in a dream, vacantly staring.

"Is this your dead man?"

Hansen jerked around. "He isn't dead, then?"

"No. Stunned."

Hansen laughed a little, very bitterly. "I might have known. You can't kill the devil."

"You—you tried to kill him?"

"Hell, yes!"

"But why?"

"Why?" Hansen muttered. "I had a damned good reason, beautiful lady; he was willing to let you die. He didn't want to let me save you, and I had to save you."

The girl lifted her head and looked at the navigator soberly. "We're all going to die. I've seen the chart. The ship's driving toward the Hole."

"Yes," Hansen said, chuckling. "But we're not all going to die. You and I and Moran—we're safe. We're going to live."

"I'm afraid you're a little mad," Tam said softly. "How can that be?"

"We're in this cabin. As long as we stay here, we're safe. Moran knows. Moran knows how to work the gadget. That thing there, against the wall—he calls it a dimensional converter."

The girl turned her eyes toward the sinister flower; it was beautiful and terrible. Fascinated, she asked:

"How does it work?"

Hansen's face drew together in a sudden tight mask. He said heavily: "I don't know. Moran can explain it to you, maybe. He knows. When the time comes, he'll turn that little cube in the niche in the wall, and this thing will shift the C cabin and everything in it across the dimensional line. That will happen just as the rest of the ship strikes the Hole.

"But we won't be in the ship, understand? This cabin is like a ship inside a ship; we'll be in it, and Moran says it will be in a million other places—— I've just happened to think. The cube —you've got to know the angles before you can adjust it; like a safe, you've got to have the combination. And Moran is the only one who knows the combination."

He stared stupidly at the man on the floor. "And I've knocked him out. We've only got a little less than an hour, before the ship hits the Hole. I'm a fool."

THE GIRL lifted her bright head. "Then we've got to do something. I don't believe there's any concussion. He's stunned; that's all. We can try to bring him around."

"Sure," Hansen said eagerly. "Sure, that's it. Maybe we've still got a chance, darling."

"Have you got any cold water?" the girl asked; her face was calm, evidencing no emotion.

Hansen said: "I'll get it—to put on his head. That's the thing they always do, isn't it? Sure, we've got some. We've got water, synthe-food, every-

thing. I told you this was a ship inside a ship."

"All right!" Tam cried. "I'll take your word for it. Now get me the water."

He rubbed one hand across the back of his neck, grinning sheepishly. "Yeah; I'm talking too much, I guess. I feel kind of funny. I can't think straight or something."

He went over to the W-generator, returned with a flask full of cold, absolutely colorless fluid. "Synthetic," he said in queer voice, "but *he* won't know the difference, will he?"

"Give me the flask," Tam said.

He handed it to her like an obedient child, his round eyes adoring her with a vacant intensity. Shivering a little, she commanded:

"Now go sit down somewhere. You're tired; I can see you're very tired. I'll try to bring Moran around. There's nothing for you to do."

Solemn-faced, he saluted her, giving her the full ritual of the space code. "Right, chief!"

He walked to the control board, now ablaze with warning lights futilely signaling that the ship was off course. Buzzers and bells made a subdued clamor at his approach, and as his body came within range of the photo-electric eye, the automatic pilot quietly disconnected itself.

"Damned clever!" he said dizzily, "Damned clever, these machines! Except now they're no good. No good at all. Can't save us, can you? Can't save us, you clever little clicking devils. I better sit down."

He dropped heavily into the pilot's seat and rested his twitching face in his hands. He began to groan softly to himself, muttering over and over: "I'm sick, I'm sick, I'm sick as hell."

It was the wailing of a frightened child.

The girl, leaning close to Moran, rubbed his cold temples with the tips of her fingers. Quiet and steady, her warm hands traveled over his forehead. Then she took the flask of water and let the liquid fall, one icy drop at a time, on the blue swelling at the back of his skull. He shifted his head feebly, whispered:

"Who are you? Thanks, thanks; that feels good. I can't see you yet, but you've got fine hands, soft hands. You're a woman. Get away. No women allowed in this cabin. Get away from me!"

His eyes went wide all at once, blazing like suddenly lighted windows, and his hatred gleamed out at her, mingled with a curious fear. She sensed instantly that he hated her because she was a woman and yet he was afraid, afraid to melt the bars he had welded around him long ago, afraid he might yield to a little tenderness and warm human feeling. He was a scientist first and only human now and then.

"I'm Tam Graham," the girl said simply. "Didn't Hansen mention me?"

He struggled up on his elbow, pulling his head from her lap. He was terribly conscious of the scent of her enveloping him.

"Hansen. I see, I see! He brought you here. He thought he'd killed me, so he was going to put you in my place. You know about the converter?"

"Yes," Tam answered. "I know."

"Then why did you call me back? I was very close to the gate of death. The gate was opening, and suddenly I was pulled away. Something took hold of me and wouldn't let go. That was you."

The girl whispered: "I just couldn't let you die. Unfortunately, I'm a Christian. By your creed of scientific savagery, I'm soft. But I couldn't let you die even though I knew you were my enemy."

STRENGTH was returning to Moran's body in a creeping tide. He had his armor on again, all over; he

had no weak spots showing. He grunted, the sound full of contempt.

"You're lying, of course. Probably don't realize it yourself, but you are lying. Overlaid with all that careful rationalization of humanity and Christianity, there's a real reason why you revived me. I'll know as soon as I've talked with Hansen. Hansen can't hide anything from me—that's why he tried to murder my body."

With a grinding effort, he sat up. The room was a broken blur of lights and shadings; he squinted his eyes with a painful concentration and waited, beating down the taut nausea that crept over him. His head ached horribly, but he ignored it.

"Where's Hansen?" he demanded, after an instant.

The girl glanced at him. "Right before you. In the pilot's seat. Can't you see him?"

"Yes; of course," Moran growled. The room began to settle down around him. Pieces fell into place until the shape of the walls, the glow of the lights, the contours of the many mechanisms that crowded the cabin, were no longer a puzzle; things were not quite the same, but he made out a painful semblance of reality.

"Your eyes," the girl said. "They're queer. You're—you're not blind?"

Moran laughed. "You may wish I was before I've finished with you two—but I'm not. I'm in pretty good shape. I can handle you and that murderer. I've just figured out why you brought me around. Hansen remembered that he hasn't got the combination to the cube. He couldn't work my magic. That makes me boss again. He'll do what I say because he has to."

The girl said fiercely: "One thing you'd better consider. He isn't right in his head. If you push him too far he'll go at you again. If you don't want to die——"

"I've been very near to dying," Moran whispered, his eyes receding. "And it isn't bad. It isn't bad at all. In fact, it's quite pleasant. You'll like it."

The girl stood up, tight-lipped. "What do you mean?"

"It's your turn," Moran answered, flat-voiced. "Hansen is going to take you back to the rest of the sentimental cattle who threw their right to live away by coming aboard this ship. You were warned, weren't you? They told you at Korna you could probably expect death."

"I was warned," the girl said, looking down. She stood very still, her breath making a faint rattle in her throat. "Give Hansen the order. If he obeys your command, I'll go."

Moran got on his hands and knees and then pulled himself to his feet with a jerk. He swayed a little, but remained erect; the muscles in his hard hands knotted together and his veins were big with blood, but he stayed on his feet.

He shouted: "Hansen!"

The man in the pilot's seat turned, creasing his low mumble. Empty eyes regarded iron eyes:

"Yes, commander?"

"Take this girl to the ladder. She goes aft. You know no women are allowed forward here."

The dazed blond giant stumbled to his feet. "Yes, commander."

The girl shut her eyes; with pale lips she whispered to Moran: "This is your victory, scientist. Glory in it!"

MORAN braced his legs wide apart. He regarded her without passion, without animus; his hatred, his fear, were both gone, or pushed far under the surface of his thoughts; unguarded by his will, his brain had experienced a rebirth of emotion, but his control had returned. He was dispassionate. He sat in the seat of his consciousness and touched the studs, worked the levers, turned the switches of the efficient mechanism he had made of his body.

"It isn't a question of victory, woman.

We decided on a plan for this emergency. His life is more valuable to me than yours; his brain is better than yours. The cells of his cerebral cortex are stored with intricate technical knowledge upon which I may need to draw. You have nothing; you are only a woman. There are many women."

"There are many men."

"You are pleading?"

The girl bowed her bright head. "I find myself—afraid. I'm sorry. Dying may be pleasant, as you say it is, but life to me is more pleasant. I've got so much to live for."

"How very original!" Moran said softly. "You're unselfish. You're a Christian—yet you're pleading for yourself. You're willing to stay here with Hansen and myself, where you have at least a chance for life, rather than go back there with those who have been your companions. Are none of them your friends? Do none of them mean anything to you?"

The girl tightened her hands together. "Yes, yes! But I can live without them. It's not for myself so much that I want to go on living."

"I see," Moran said. "There's a man on Jupiter. You're going to him."

"Yes," the girl whispered. "After ten years."

"Yours is a great love," Moran said soberly. "I'll grant that. But what about all these others on the ship? Do you think they came on this voyage, risking everything, becouse they were stirred by a small desire or a puny longing, by faint friendship or light love?"

"Ours is a rare thing," the girl said proudly. "An equal love. His is no greater than mine; mine is no greater than his. He loves, and he is loved. I love, and I am loved."

The vacant voice of the blond giant said, all at once: "The woman stays, commander. Here. With us."

Moran hit him with a gouging glance. "You're noble, of a sudden. If she stays, we all three die."

"You mean——" the girl cried.

"Listen," Moran said. "Dimensional mechanics aren't like simple arithmetic. The converter is inconceivably delicate. Hansen—you remember the examination, the physical searching and pounding, to which we submitted before we left Korna-on-Mars?"

"I remember," the giant said, wandering in a maze.

"We were weighed, down to the last molecule. The lines of our bodies were measured with calipers. Our uniforms were fitted and shaped to a certain size. Every mechanism in this room was treated the same way; dimensionally photographed. Those dimensional pictures were fed into the calculators while the converter was being assembled and powered. The converter will swing you and me along the dimensional line, bring us back somewhere inside this cabin, maybe a few inches off center, but we'll make allowances for that. The girl can't go. Nobody else can go. The converter is set to handle two bodies of a certain weight, a certain size, a certain shape. See?"

Hansen turned his pleading, bewildered eyes on the girl. "I tried to save you, didn't I, didn't I? But I guess he's right. He's always right. Now I can't do any more."

THE GIRL raised her hands and touched her hair carelessly. Something like laughter pulsed from her white throat. "You've been grand, space man. You've tried to be a hero, haven't you? All right—I won't let you down."

She looked straight into Moran's hard face. "You've saved me in spite of myself, scientist."

"I don't get that."

"I crawled at your feet, begging for my miserable little life. I thought I was important because I was a woman, because I loved a man, because love is

a rare thing in the scheme of the universe. But I see it now—love isn't rare. It's common. There are millions on Earth who have the kind of love I thought I shared with one man alone.

"It's glorious to think of that. I'll think of it when I'm dying—back there with those plain little people you called 'sentimental cattle.' I realize now, I'm not important in myself; only what I had was important. And the universe is overflowing with it. If I didn't believe that, if I thought that kind of tenderness would die with me, I'd fight you. But it won't die. It never dies."

Hansen followed her across the room, opened the seal.

He watched her go along the ladder; for a long time he could see her bright head, held high like a torch; then that, too, vanished in the gloom that crept over the back part of the ship.

"Close that seal and lock it home!" Moran ordered with sudden urgency. "We've only a minute longer."

Hansen turned around; his hands were damp with some kind of moisture that had fallen from his face. He blinked his eyes.

"She was glorious!"

Moran was at the chart, muttering calculations and abstruse formulæ.

He called over his shoulder: "Take three steps from the seal and lie down on the floor. Close your eyes. The swing along the dimension line is bound to knock us both cold, and we may as well be comfortable. When I've set the cube to reverse itself, I'll be there beside you."

Hansen took three stiff steps into the room, his knees jerking like those of an automaton. He flattened, folded his arms on his chest, shut his eyes. He whispered, hugging himself: "I'm so tired——"

Moran touched the cube in the wall and sprang back from the blaze of burning brightness that seemed to splash outward from the brilliant surfaces. Blinded and reeling, he felt his way along the floor of the cabin, stumbled into Hansen's body, and sank down, bruising his shoulders on something metallic and adamant.

Sensations left him, and perceptions he had no more. His world of being was not black, but blank.

The control cabin became riotous with ropes of light—light visible and invisible, shaded and colorless, warm as flame and cold as space——

V.

WHEN MORAN returned to the controls of the mechanism that was his body, he felt like a stranger in an old house; there were so many things that seemed familiar, yet none of them responded to his presence as they might have to a remembered master. He had been gone so long, he had traveled so far away, that his body had forgotten him.

He struggled to get back into his own brain; to crawl within the shell that had been his; grimly he attached himself to nerve centers and dug into the folded convolutions of his cortex. Then he got home—contact! He sent messages, and faint responses returned from the far-reaching periphery of his nervous system. He gave commands, and there were feeble efforts at obedience.

He was very cold. His body seemed to have taken on a frozen rigidity while he had been absent. Now he could sense the fire of awakened life climbing his body, circling dead nerve ends, spanning some still sleeping synapses, moving forward in little aching pulsations. The hot broth of his blood began to circulate, halting an instant to burn some knotted cold spot from his arteries, then booming and roaring through the great valves around his heart.

His heart woke; there was a heavy blow against his chest, racking him all over with dull pain. Something thudded and thundered against the walls of his

body cavity, hurled his blood stream outward in spurting fountains that filled his empty veins; then began a regular thumping and pounding, like the beat of compression engines. His heart had begun to throb.

Still he didn't move, because as yet he could not. Caught somewhere in a dusty corner of his brain was the impulse that could tell his muscles his bidding, but it took him a little time to reach into his mind and remember where the nerve spark lay hidden.

He was sure of one thing only—he was alive. He could move. He heard himself breathing. He felt the pound of his heart beating the reluctant blood through his veins. In a minute he would open his eyes and he would see—— What?

For a little while he lay where he was, waiting. He did not know what he expected. There was no change. All was quiet. He stopped his breath an instant—completest silence. He could hear nothing then except the loud sound of his own heart.

There was something smooth and hard-surfaced under his body, holding him up, supporting him. Then he remembered—he must be lying on the floor of the control cabin. Exultation quivered through him; the cube had worked, evidently; they had gone along the dimensional line and returned. Successful experiment! Write that down. Score another victory for science.

He wrenched his eyes open. For an instant he got the full glare of a bright cold light full in the face. Then he was blind again, and the black dark was so deep around him that he seemed more blind than he had been before. But the darkness fell away, a layer at a time, until he could see again.

Very carefully, because he could hear his muscles creak and groan like tight wire, he put his hands behind him, braced himself first on his arms, then pulled himself to one elbow, and at last sat up.

He looked around. The room was familiar to him, almost the same as he remembered it from the time he had glanced at it last, and yet it was not the same at all. It was still the control cabin of the *Star Ship Invincible,* but he was lying on the floor under the pilot's seat; there had been a perceptible shift, then, in his space-time position. Of course! Couldn't expect the thing to work perfectly. He would probably notice other changes.

The lights were turned on, just as they had been at the instant the ship had gone into the Hole; cold Benson globes, all white, snowy glow, harsh and direct, casting thick black shadows in straight lines. He looked at them steadily for a minute, sitting cross-legged like an Oriental and staring upward.

"Queer effect!" he muttered slowly.

A little shiver went over him. After all, this whole room and everything in it had been subjected to an unprecedented change, taken over by an alien force; he couldn't be surprised at anything, if he was going to be logical. But what an opportunity—he had the chance of making a critical study at firsthand of the results of a unique experimental undertaking. He'd have to be impersonal, dispassionate; even if there had been changes in his own body.

"Record everything on a tape spool," he admonished. "Mustn't forget that."

He couldn't get his eyes away from the lights. All the round white globes had a reddish halo, and the light they gave was shot through with black twisting, streamers, impalpable, intangible, like the shadows of shadows.

With difficulty, he took his glance from the Benson globes. He looked at the control set-up. Queer, very queer! The great balanced cylinder of the control base was out of line, slanted wrong; it was the wrong shape. The cylinder seemed to stretch away interminably,

gleaming all over with reflected glare that hurt his eyes, as if this brightness was full of little sharp burning spears. The pilot's dais had been touched with the same luminous veneer, gave the same illusion of distortion and distention.

"Elegant!" Moran said. His voice rang hollow, but he wanted to hear himself talk. "Very elegant, indeed—I don't think. I wonder if I'm going to be sick."

HE FELT that if he sat still any longer he would be. He got on his feet. His legs wavered like rubber stilts under him. Rubbing the back of his hand across his forehead—his hand came away damp—he glanced down at himself; there appeared to be something odd about the shape of his feet, but he couldn't make out exactly what it was.

All at once he was taken about the middle by a hammering nausea; he had hoped to avoid it by standing; no good, evidently. The sensation that shook him was more physical than chemical, he knew that; a mere contraction of his smooth muscles due to shock and nerve tension.

Yet it was odd, very odd. He'd never been sick like this before. An uncontrollable trembling began in his rubbery legs and shot over his body in vicious recurrent waves. The trembling, the vibration in his legs, the torn soreness of his muscles, had no great significance for him then. Later he was to think strange thoughts.

The first step he took, his left knee gave way, as if the bones had melted. He fell, hitting the floor hard. No sensation at all; that was the queerest thing yet. His body must still be numb from its long freezing.

He got up, feeling stronger. He had better luck the second time he tried walking. Looking at the polished floor of the cabin, which was bright as a mirror, he saw that he wabbled like a duck, yet it was locomotion. He wondered, as he began to take a few steps cautiously, why he wasn't hungry. But how long had it been since they had made the dimensional swing? It might have been a millenium; it might have been only a minute ago.

He didn't think he would want food again for a long while. He felt full and warm inside now, and throbbing with a curious pulse of exultation; he had an unreasoning desire to leap up and touch the "ceiling" of the control room. He actually tried it, but fell back after going upward about five feet, which seemed to prove that the ship's gravity grids were in operation. The ship—was he in the *Star Ship Invincible,* or in the control cabin floating free in space? If the cabin had left the ship behind in the Sink Hole, the cabin was now a small ship itself.

He crossed to the visi-plate above the Danler navigation chart. The plate still operated; a faint blue aura surrounded it. He touched a button and the blue became black, the black of outside space. Stars! The plate was speckled all over with perforations of light. In the distance, receding, he saw a web of darkness deeper than infinity; a black hole in the void so dark that it was a purple scar blotting out the stars behind it.

As he stood there, he was conscious of a humming that came through the silence. The automatic switch had jerked along its slot, and the special Donlin engines in the cabin had taken up their beat. He looked down; there was a slight luminescence rising from the gravity grids in the floor plating. Good; the power circuits inside the cabin were unbroken.

There was good air for him to breathe, warm and slightly scented, as it had been before he had gone down into that sea of blackness. It seemed to be all right again everywhere, except for that curious impression his eyes took in every time he stared at anything for very long. There was a scrambling of

his vision, so that he briefly thought he could see the air he was breathing, as a white vapor sucked in and out by his lungs. The great glowing panels of the direction board were twisted out of focus, indefinitely extended behind themselves in blurry reflections, as if they were partly shadows and partly real.

Then he saw Hansen, still crumpled on the floor. He took two quick steps, bent down and touched the other. The navigator's skin was so cold all over that it crackled under the tips of Moran's fingers like frozen fire. Moran turned back the other's eyelids with his thumb and looked at the balls; the man's eyes were turned upward in their sockets and showed all whites.

To any evidence the blond giant was dead. Moran slapped him in the face. He didn't move. Not a muscle jerked or quivered. His jaw didn't even take on any greater color. It remained ice cold and very white—a dazzling ivory pallor. There seemed to be absolutely no blood under the skin of Hansen's cheeks. Moran had seen a man once who had been found frozen in a glacier on Earth, and he had been like that.

Then Moran looked again at Hansen's eyes. The lids had begun to slip shut, as if pulled by springs, but, as Moran watched, Hansen seemed to exert a savage effort, and the eyelids stopped just short of covering the under edge of the eyeballs. Then Moran couldn't believe that Hansen was dead.

Moran bent over him a second time. Very carefully, the scientist took a thumb and held the eyelids back, kept the pressure until when at last he let go, Hansen's eyes remained open and fixed. Now Moran was sure there was a gleam somewhere in their dazed depths—a spark, grimly struggling upward, attempting to find some way of signaling.

His telepath headgear was still on his body; Moran saw it hanging loose on the belt of his emergency suit. Moran picked up the narrow band of silvery metal and slipped it in a loop around the cold temples. Then he put on his own helmet and concentrated his thoughts in a tight beam of mental energy. Urgently he prodded the inert brain of the limp giant, then waited. If Hansen was conscious enough to will a single labored thought, contact would be made; Moran's alert intelligence could bring him to awakening.

TAUT, Moran crouched, waiting. Hansen's mind was dark, calm as a placid pool, so far as Moran could probe into it without the other's will aiding him.

Moran roared, in a great soundless bellow: "Come out of it, space man! I command you!"

And Hansen moved. The eyes turned. Moran leaned very close, glaring into that frozen face.

"You've heard! Now obey!"

Creaking, the stiff lips parted, a little puff of breath came out, a faint groaning whisper: "Yes, commander."

Moran tore off his headgear triumphantly, sprang up, ran to the W-generator, got water. A cold sparkling rain fell in Hansen's face.

"Enough!" Hansen grunted in a hoarse voice. "What the hell you trying to do—drown me?"

Moran felt better all over. Now he had some one to command, some one to feel superior over, a man to perform obediently at the urge of his will. He warmed; it wasn't good for him to be alone. Even this fool offered a kind of companionship.

"I couldn't drown you," Moran said, grinning. "You've been dead once, to all intents and purposes. You can't die twice—or can you?"

"So the damned thing worked!" Hansen exclaimed with awe. "We've swung along the dimension line, and we've got back, shipshape. That's magic!"

"Magic?" Moran shouted, swelling

with anger. "Don't be a superstitious fool. That's science!"

"About the same, isn't it?" Hansen asked.

"No; it isn't," Moran growled. "Don't be an ape."

"Have it your way," Hansen agreed submissively.

Moran stared at him, very sober. For some reason the blond man seemed smaller than he had been, his face was wrinkled and wizened into a dried mask, and his legs were twisted to a queer shape. Moran wondered if he would be able to walk, using those dead legs.

Yet when Moran stared into those strange eyes at close range, he saw a reflection of himself, and *he* seemed to be the same as the navigator was—turned and shifted in his body, as if the center of his equilibrium had been reversed. Moran thought, so there have been great changes in us, as in the machines crowding this room. But—how deep did the alterations go? His calm curiosity probed for the answer of that question.

Hansen observed, in a hoarse voice: "Say, you look damned funny! Like you've had the bends, or something. Been space sick?"

"Listen," Moran said harshly. "You don't think we took that joy ride in the grip of dimensional forces and got away clean, do you? Sure, I look funny. So do you. It's one of the—the changes. You'll notice other things that are—damned funny."

"Maybe I talked too fast," Hansen mumbled. "Maybe the converter didn't work after all. Where are we? Where's the Hole?"

"Behind us," Moran stated, calm-voiced. "We're on course, and close to Jupiter. Take a look in the v-plate."

Hansen got up and went over to the little screen. The Sink Hole didn't show there at all now, nor any trace of it. The sky looked calm, and it was black the way it always had been since Hansen had been aspace, but it was the kind of black a man can look at and understand; there were stars in it, different colors, and the Sun away off in the distance like a red-hot blinking eye put there to watch over you. Jupiter the giant seemed closer, and Hansen thought with sudden hope that they now had at least an even chance of making the Dome.

Moran crossed the cabin and examined the three cylinders standing against the curved wall. That wall was blank, had no glassite porthole, and most of it was covered with a curled mesh of wire, an intricate network of apparatus, because the three tanks carried all the little ship's supplies of air and water and synthe-food. If something went wrong in any part of that maze——

Hansen watched him as he tested the tanks. He came around on his heel, face impassive.

Hansen said: "Well?"

"Enough there, if we're careful."

Hansen expelled his breath gratefully. "We're in luck."

"Luck? No. It was calculated how much supplies we'd need before the ship left Korna. The calculations are a little in error, but very little. And I counted on a marginal deviation."

Hansen said: "Oh, hell!"

Then for an instant the navigator felt that something had gone wrong in his eyes. Yet it wasn't that. The truth was that Moran was getting smaller.

"Chief!" Hansen whispered hesitantly.

Moran looked up, eyes tight with an inward struggle. "What?"

Hansen stuttered: "I dunno how to say it. But you—you're kind of shrinking."

"Yes; I know."

MORAN kept his cold composure. But his body was terribly changed; he was altogether different from the commander who had shipped with Hansen

on the *Invincible*. Then he had been a fairly big man, almost as big as the navigator, and strong as stellite; still young, still with the full look of youth and strength in his face. This was a shrunken little old man.

He came close, stood a moment with his face up against Hansen's. He put out a hand to touch the navigator, and the other jerked back, because that outstretched hand looked like a brown and withered claw. He seemed—he seemed to have caved in upon himself.

Hansen shook; his teeth clicked. "What—what's happening to you, commander?"

Moran grinned crookedly. "You'll know soon, I hope. You've been subjected to the same forces. The effects should be very much the same on you."

"How—how does it feel?" Hansen whispered. "What's it like?"

"Wait," Moran answered confidently. "Just wait. You'll get a dose of this medicine soon enough, friend."

His face was chopped in little wrinkled squares by short bitter lines of agony.

"I'll tell you this much," Moran said with a livid smile. "It isn't very pleasant. Not at all."

"Damn you!" Hansen groaned. "You needn't torture me before my time comes. Why are you always throwing little knives into me?"

Moran didn't answer. He was too intent on keeping any sound of pain from escaping through his lips.

VI.

MORAN tightened his mouth; as he did so, Hansen could see a plainly visible sifting and sinking that seemed to go on simultaneously all through his body, as if the orbits of the atoms that composed his flesh had abruptly been decreased in the diameter of their paths and closed in upon themselves.

"I'm still getting smaller?" Moran said after a few seconds.

Hansen nodded. "Every minute I'm standing here I can see it happening. You don't come quite up to my shoulder now, commander."

He seemed to stand there considering something abstract, looking very quiet and detached. He appeared to have gone away off and was observing himself as from a reasonable distance. Before then Hansen had hated Moran very heartily, with the deep hatred of an inferior for a superior mind, but something like admiration crept into the navigator now; the commander was so cool and calm, as if he had climbed out of the shell of himself, somehow, and could stand to one side, regarding himself with no prejudice.

"It'll stop soon, I think," Moran said suddenly. "I've had it once before, right after I woke. Then I didn't realize what was happening to me. I just thought I was getting pretty sick. But now it's plain. All clear."

"You're right," Hansen said, "about one thing at least. It seems to be stopping."

In another instant Moran ceased to shrink. The effects remained; his skin hung in loops and folds all over him, and his cold eyes looked too big for his unraveled face. With difficulty he moved, climbed up on the pilot's seat, and sat with his little legs hanging over the edge of the metal-fabric chair.

Hansen couldn't look directly at him. The navigator said: "Well, what's next? What'll happen after this?"

Moran gave a slow shrug. It was queer to see his skin quiver in a ripple along his loose-jointed shoulders.

"That," Moran said, "is what I don't know—yet."

Hansen didn't move. There was silence between them.

Then Moran said: "I know what it's doing to me, and that it will come to you in a little while, but I haven't quite figured out certain things. I haven't found out why it stops once it gets

started, and where it will end if it keeps on. Theoretically, I don't suppose there's any limit at all."

Hansen frowned. "You haven't explained a damned thing to me yet."

"Well, the conditions are paradoxical," Moran said thoughtfully. "There's room in this for some beautiful paradoxes. It's plain that the effects you and I have undergone, along with everything else in this room, are due to the distortion caused by dimensional change. We weren't built to be in a million places at once, see. That's why we can't hold our old shapes; you know, I'm not sure that I'm actually getting any smaller. It's a change in shape, visible to you and me as a change in size."

"Go slow," Hansen said, heavy-voiced. "I'm stumbling along behind you."

Moran grinned. "Our constituent atoms, friend, have been twisted and shuffled around, and they're having a devil of a time finding their places. They've had the most awful wrench they could have got anywhere in the universe; they've been jammed all together, and then stretched structurally outward, and then set free in their old orbits again. But they're not staying put; that's all. They haven't got to a condition of equilibrium yet. That nice balance between attraction and repulsion, between protons and electrons in the nucleus, and electrons outside the nucleus—that balance is overthrown, releasing chaotic forces within the atoms, and naturally the atoms shape the molecules. See?"

"I think so," Hansen muttered. He rubbed a hand across his eyes. "If you're right, and you're always right, time's called for you and me. There's no limit. There's no telling where this thing will stop?"

Moran shook his head. "No. Only there's no guarantee that we'll die, now or later. There was some fault and molecular slippage when I contracted this time. I got out of proportion at least to my eyes and your eyes. That's the reason my skin's loose and I look so queer. If it comes again it may take up the slack. I don't know."

Hansen blinked. "If it stops, maybe we'll be kinds of dwarfs, or something."

"Yes," Moran said. "But I don't think it's going to stop at any imaginable point."

MORAN'S eyes gleamed; he was fascinated by that thought. He might sink down slowly into a submicroscopic universe. Or if the change was, as he believed, a relative alteration in shape, he might enter a cosmos of different dimensions, a brand-new world, unexplored, opening to his avid gaze, his insatiate curiosity. The possibilities were illimitable for experimental operations. The chance was his.

Then Hansen remembered something. "The ship!" The navigator's voice was hoarse with excitement.

Moran said: "What about the ship?"

"If we keep on getting smaller, and the ship doesn't shrink—it hasn't so far—how will we eat? What the hell will we drink?"

Moran laughed. "Don't worry about that. Are you hungry now? Fill your belly up, then. If you have time to digest it before your contraction begins, you'll be all right."

"Look," Hansen muttered. "If we're eventually no bigger than a drop of water, we're not going to be able to swallow anything of that size. And food—the atoms will be so big they won't go down our throats. Maybe they'll be bigger than we are."

"I've failed to make it clear to you," Moran said. "That's because it's a paradox. We aren't shrinking; we're changing size. The ship isn't shrinking, because it's made of metal; metal's rigid, the atoms are bound tight together. When we came back from the dimensional swing, the metallic molecules fitted together and they've stayed

together; but they're not the same. They've changed shape. So have we, only in a different degree."

Hansen didn't say anything, because he couldn't speak. He had begun to diminish in size; at least to Moran's eyes it seemed that he shrank, though Moran's brain accepted it as a relative alteration in shape. An indistinctness seemed to hang about the blond man, like half a shadow. Even the features of his face, which were close to Moran, so close that the commander might have reached and touched them, were vague and blurred.

The contraction ended. Hansen didn't seem mutilated. His body was more in proportion than it had been; his face was tiny, rather wrinkled but perfectly formed; his legs had lost most of their crookedness; his head was set firmly on his neck, his arms and shoulders flowed together in a smooth line.

Hansen whispered: "I can't take much of that."

Sweat dribbled from the end of his chin. His eyes swiveled wildly. He said, in a high-pitched voice:

"We thought we were pretty damned smart, didn't we? Nothing was going to happen to us. We were safe. To hell with the Hole, to hell with those twenty-eight people we murdered! We'd get through, because we had that damned thing you called a dimensional converter. It's got us—it's got both of us around the throat."

He sucked in his breath. "Listen, I'm going to finish this. Maybe this damned shrinking will go on even when we're both dead, but we won't know it. We won't know it, see?"

Moran slid one hand down his side to the metal-linked belt at his hips and touched the round butt of his ionic projector.

He said: "All right. You've got your I-gun. Pull it out, and we'll fire together. That will end it for both of us."

"Sure!" Hansen said softly.

Moran could see the gleaming in Hansen's belt where his hand projector was, and in his brain the commander had a vision of a bright silver thread, hot and white, spiraling across the narrow space between them, striking death home to them both.

Hansen dropped his fingers to the grip of his little gun, but he had no chance to lift it from where it swung at his waist. Moran had drawn, thumbed a stud, sent an arrow of flame scorching into the blond man's face.

Hansen swayed backward, bending at the knees; he went over, hitting on his shoulders and head. There was a slight thump, like knuckles striking metal; that was the sole sound, except for the snake-like hissing of Moran's flame-thrower.

Moran tossed the little gun away. "I'm ready," he said softly, looking at the stars. "I'm not going to die."

VII.

FOR THREE days there had been rain on Jupiter the giant. The rain was scalding hot; it turned to steam as it fell, burned the ground where it struck. The great bronze Dome of the interplanetary station felt the touch of that liquid fire; scales were melted off the outer shell of the Dome, metal ran down in molten waves.

The air above and around the Dome was crowded with tortured flying things, the bizarre creatures that inhabited the upper levels of the great planet. There were strange currents going upward through the atmosphere; the laws that governed the magnetic forces of worlds were seemingly broken.

Over the Red Spot was created a reverse field of gravity. They observed it from the Dome; flying things passing that way were hurled outward at savage speed into the far reaches of the atmosphere. The Red Spot itself remained as always—an enigmatic sea of luminescent flame.

First into the writhing atmosphere

above the Red Spot the little ship from space had entered. There was no down pull of Jupiter's immense gravity to increase its terrific speed, but instead was this magnetic repulsion that checked the ship's free fall, wrenched it partly off its course. The controls of the small ship were locked; it traveled along the Walton Arc that had its ending within the interplanetary station.

The little ship fell in a slow bright curve through Jupiter's thick and steamy atmosphere, crumpled its silver shell into the red ground two miles from the Dome.

The electro-telescopes in the station had followed the strange ship in from space. A man came up into the little room at the top of the Dome where John Graham, G-16, sat silently at his key. The man saluted and said in a stiff voice:

"The ship Garth told you a day ago we were to watch for——"

"Yes," Graham said, grim-faced. "I saw it fall."

"You're to take charge of the search party, G-16. The station commander's orders."

Graham nodded. "I obey," he said gently. "I always obey orders."

A day later the rain stopped. Six men ventured out from the Dome, wearing space suits, breathing Earth's atmosphere. John Graham led them. They had taken readings from direction-finders before leaving the station, and they knew about where the ship had fallen. The search was not long.

The little ship was found, almost undamaged, the curious dull metal of which it was fashioned being neither twisted nor broken; where it had given way it had been forcibly torn apart. It was a strange shape for a space ship. It was like a flying cube, oddly distorted along its angles.

There was a seal in one side of the cube. They broke the seal and Graham went in first. He went in, stumbling. There was nobody alive inside. One glance told him that.

FOR A MINUTE he halted there with the blind agony of his unreasoning disappointment mirrored in his eyes; long ago he had believed he had given up hope, yet evidently there had been a spark still left. He shook himself, swinging his hands, and moved forward into the ship.

It wasn't a ship at all. It was the control cabin of the *Star Ship Invincible*. There was a dead man lying on the floor, the body curiously shrunken.

"Hansen," Graham muttered softly. "Moran?"

No sign of the commander. But in one of the curved seats near the control board he found a spool of metallic tape, and beside it a flash tube for recording messages.

The men from the station had come in quietly behind him and stood staring.

One of them asked: "What's that, sir?"

Graham turned and pushed past them, unseeing. He flung back over his shoulder a mutter of words. The man who had spoken glanced around the room.

"He's found some kind of a record. He's going back to the station. We're to stay here with the ship until he gets further orders."

Graham traveled fast to the recording room in the Dome. He sat down, put his eyes to the eyepieces provided, fitted earphones to his head. Then with slow careful hands loosened the clip that held one end of the tape from unraveling; he fed the thin metallic strip into the slot of the translator, touched a dial.

A long time later he reached up slowly and thumbed a stud. The narrow tongue of metal ceased to flow into the translator. He took off the headphones he had been wearing, tore away the eyepieces. He put his head in his hands and groaned.

Two men had come into the dim room. One was the station commander.

The commander said: "What have you found?"

Graham grinned queerly. "This is the recording made by Captain Moran. It's all there—what happened to the *Invincible*. But it's not a very pretty story."

"I see," the commander said. "What have you done about the little ship we saw fall?"

"I'm having it brought into the Dome. Are there any orders you want to give me?"

The commander hesitated. "No; I don't think so. Wait! We've got to make some disposition of the bodies."

"Bodies?"

"The bodies of Hansen and Moran," the commander said impatiently. "Didn't you find them in the ship?"

"There was only one body," Graham answered, grim-faced. "Moran is still alive—somewhere. He's gone into a different dimensional universe, but he's alive. He recorded everything that happened until his change in size took him beyond contact with the tape he was using. He even recorded his murder of Hansen."

"He murdered Hansen?" the commander whispered.

"Hansen and my wife," Graham said, very low. "I'm waiting for further orders, sir."

"No orders," the commander said heavily.

Graham traveled upward to the signal room high on the curve of the Dome. His relief stared.

"You're early, G-16. You've an hour yet."

"Let me take over," Graham said. "Let me take over, will you?"

The other shrugged. "All right with me. You're a fool for work. Why don't you get a little sleep?"

"I don't need much sleep these days," Graham said.

He sat down, closed in once more by sky and stars; he looked at the black, pitiless void that was all around him, and the taste of bitterness was in his mouth.

In the last 3 months there have been 294 separate requests by readers for Astounding Stories to become a twice-a-month magazine. Do you agree? Write your opinion to Brass Tacks and give your reasons. Will you?

GREEN GLORY

A story of a man of the far future

by Frank Belknap Long, Jr.

Illustrated by M. Marchioni

AS THE TINY human shapes poured alertly through the subterranean artery, sharp clicks emanated from the magnetic audition disk in the roof of the passage. The clicks announced that the bee swarms were preparing to wage gruesome and relentless war.

To the ant people and their tiny human servitors the bee army's dissolv-

ing-fungus tissue was a menace that obscured the splendor of the sun and stars and the joys of shared labor in the sweet-smelling earth. In grim procession the midget shapes moved forward, and Atasmas sang and chanted as he led them. He sang of war and glory and sacrificial death. A huge yellow aphid sat perched on his gauze-clad shoulders and fed him as he advanced.

In his inmost heart Atasmas despised the little stupid insect with its cumbersome-clawed tarsi. He knew that wingless aphids had once served the ant hordes with complaisant humility far back in the dim legendary ages when his own race was the opposite of complaisant. The aphids were mere contented cattle, mere unthinking milk producers for the omniscient ant people.

Atasmas knew that he was nearly as insignificant as the aphids in the ant people's sight, but he knew also that his own little race had once wielded immense power on earth, holding all other animal forms in abject thralldom. The aphids had never enslaved the hostile forces of nature, and had no idea of the majesty of the far-flung constellations and the vague, tender glory of the night shapes which visited men in dreams.

Deep in the earth, in luminous damp tunnels Atasmas' kind had labored, dreamed, and died for millions of years, enduring their little May-fly span of life with ardent heroism, and remaining unflaggingly devoted to the ants' exalted creeds, their world-subduing techniques.

The ants were great. Even strong-willed men like Atasmas conceded it and were proud to serve as nurses for the large-brained grubs, as removers of excrement in the dark pits, and as relayers of such scented delicacies as the embalmed bodies of small spiders, roaches, and still smaller mammals.

Along the damp, glowing tunnel Atasmas marched, the triumphant head of the tiny human procession that had formed by itself in response to the sharp clicks in the circular magnetic disk in the roof of the tunnel.

"War formation—war formation—war formation," announced the revolving disk, and Atasmas had marshaled the others into a smoothly progressing service line, thirty abreast.

"A man should die gladly when the disks move," he chanted. "With singing and rejoicing he should merge his little worthless personality in the great dream. When men die in defense of the great dream, the eggs in the abdomen of the queen mother are preserved for a destiny so great that——"

The words froze suddenly on his lips. A circle of light appeared in the roof of the tunnel and a long, attenuated feeler fastened on his shoulder. The aphid hopped to the ground with a frightened screech.

Atasmas groaned and his little body stiffened. He knew that incompetent men were lifted at frequent intervals from the tunnel by the small workers and carried up through long arteries and vertical chambers to the directing queen mothers in their luminous cells.

At the thought of losing his comparative supremacy as a leader of his kind, Atasmas' brain grew numb. He had thought himself secure, for he had served always with alertness and efficiency. But many were the sins of omission which a man could commit almost unconsciously, and Atasmas was sick with the thought that he had perhaps violated some minor but important taboo.

The feeler laid him gently in repose in the center of an immense, chitin-armored back. Then the small worker began its slow ascent to the cells of the directing queens. From his vantage point on the insect's back, Atasmas was privileged to survey with swift wonder the war preparations in a hundred intervening cells.

He saw enormous, green-bellied grubs resting with a kind of repressed fervor in long earthen trenches filled with fungus-dissolving ichors. Their soft, flabby bodies absorbed the ichors with a spongelike greediness, and Atasmas knew that when the bee swarms dropped their deadly fungal tissues the grubs would be impregnable. Though the fungus poison filtered down through the damp earth to the lowest of the nursery cells, the dissolving ichors would protect the young maggots.

UP through many cells Atasmas was carried. He saw enfeebled drones submitting with patient resignation to impregnation with the needle death. He knew that the drones would be spewed forth to mingle with the bee swarms and sow piercing agony in their midst. The needle death was a microscopic animalcule that propagated with unbelievable rapidity and feasted on insect viscera.

Atasmas observed also huge, glistening black workers preening themselves for combat, and soldier ants with flattened heads a hundred feet in diameter which would be thrust into the enormous entrance vents above to serve as stopgaps against the down-sweeping swarms of envenomed bees.

He knew that the heads would be battered into loathsome pulps, and that the thin, flabby bodies beneath would writhe in unspeakable agony as the bees pierced them with their long stingers; but to the ant people death was a kind of rapturous dedication when it served a socially useful purpose.

Something of this same sacrificial zeal flamed in the midget breast of the little creature on the insect's back. He, too, was part of the enormous dream, and he would have died to save the maggots intrusted to his care as selflessly as the ants who owned him.

There was an ominous vibratory stirring throughout the great central artery adjoining the cells of the directing queen mothers. Down it Atasmas was swiftly carried, his bearer moving with a sure-footed celerity uncommon in a small worker.

For several minutes dark dripping surfaces swept past his upturned gaze, and a peculiarly fragrant odor assailed his nostrils. Then the glow deepened about him, and the small worker came to an abrupt halt before a towering barrier of wax. The barrier was fifty feet in height, and it shone with a radiance as of burnished metal. Without hesitation the insect raised its elbowed feeler and tapped lightly upon it.

For an instant there was no response. Then the luminous partition bulged slowly outward, and the glistening globular head of a queen-preening ant emerged through it. Instantly the head withdrew, and through the rent thus produced the small worker moved with reverence into the cell of the directing queen.

THE QUEEN cell was aglow with a soft blue radiance. As the little creature on the small worker's back looked upward at the enormous swollen bulk of the single occupant of the cell, a great wonder came upon him. The eight slender scarlet rings encircling the majestic insect's abdomen, and the green dots on her thoracic segments revealed that she was the supreme ruler of the colony, the great founder queen whose wisdom and power had filtered down as a legendary fable to the little human servitors in the depths.

The small worker turned slowly on its side, and Atasmas slid from its back onto the soft, moist loam which covered the floor of the cell. Quickly he struggled to arise, to stand with dignity before this great being, whose power was so immense, and whose attributes were so godlike and omniscient. But his foot slipped as he rose from his knees, and he toppled over backward on the soft loam.

He was rescued by the queen herself. Leaning slightly forward, she stretched forth a curving flagellum and set him gently on his feet. And then, as he stood staring reverently up at her, she laid the flagellum on his forehead and spoke to him in speech that surged in cool vibrations through his tiny human brain.

"You are wiser than all the others, little one. The others think first of themselves, but you think only of us. In your humble way you have the sublime, selfless mind of an insect."

In awed silence Atasmas continued to stare up into the great complex eyes, bulbous head, and swiftly pulsating thorax. A hundred feet above him she towered, and her immense, hairy abdomen bulged with its momentous burden of a hundred million eggs. Not even the planets in their courses were so awe-provoking in Atasmas' sight.

"Even the very humble can sometimes be of service," said the queen mother.

Still looking up, Atasmas gestured with his hands. He made a sign speech which conveyed that he had no mind apart from her mind; that her willing was the light of his little human life.

The queen mother said: "Little one, the bee swarms are sweeping down upon us in envenomed fury. For a hundred millions years they have thwarted our dream of universal world dominion.

Atasmas nodded, gestured, chanted. He understood. "You may use me as you will," he conveyed.

"I will have you carried to Agrahan where the bee swarms dwell in immense metallic hives," resumed the queen mother. "You are so small that you can creep unobserved between the legs of the soldier guardian bees. You will carry into the inmost core of the central hive a spore of flarra-eson."

Atasmas recoiled in horror. The color drained from his face and a tremor ran through him. Vague hints and rumors filtering down to the depths had obscurely revealed that flarra-eson was a terrible vegetable petrifactive that fossilized all animal tissue.

By a process of intensive hybridization the small workers had intensified the petrifactive principle of certain chlorophyll-forming organisms of high evolutionary grade, and had produced a miscroscopic animallike plant so deadly and swift-blossoming that it was a menace to the great dream itself.

It was rumored that a single spore of properly planted flarra-eson would overrun hives miles in extent and envelop in petrifaction a billion helpless bees in the course of a single terrestrial revolution. So prolific, indeed, was the growth of this malignant plant that its deadly course could not be checked by any means known to insects.

Though the servants of the great dream had created it, and knew its value as a war technique, they were not unaware that its successful use might envelop them in utter and abysmal ruin. Hitherto they had hesitated to employ it, just as long millenniums ago Atasmas' own race had refused to sanction certain deadly war gases in their hideous and sanguinary conflicts.

The queen mother noticed Atasmas' trepidation, and a note of reproach crept into her speech. "You will be destroyed, of course. But do you value your little life so highly?"

Atasmas experienced a sudden tragic sense of shame and guilt. He made a gesture of frantic denial as the queen resumed:

"You will plant the spore and remain until you are consumed by the fossilizing growth. If you flee when you drop the spore, it may never blossom. The future of the great dream is in your little human hands."

There ensued a pause.

Then the queen said: "There is something I must warn you against. You

will meet the night shapes—millions and millions of night shapes."

Atasmas' pulses leaped with a sudden wild joy. "You mean I shall really see and touch the little ones who visit us in dreams?"

The queen assented. "You will see them, and touch them. They will light a great fire in your heart. But you must remember the dream and resist them. Millions of years ago, when we succored your poor frozen race, the night shapes seemed to us feeble, weak things. We refused to help them. We left them to perish beneath the weight of the antarctic glaciations, of the great flood of ice that swept equatorward from the pole. Only a few survived and were succored by the weak and sentimental bees."

Atasmas' eyes were wide with wonder. He asked: "But why do these small weak shapes still haunt our dreams?"

"Because men will always be primitive creatures," replied the queen mother. "Even though we have multiplied you by laboratory techniques for millions of years, the old, primitive love of women still burns in your veins. We cannot eradicate it. It is a source of weakness in your kind, and in that respect you are inferior to the aphids."

Atasmas affirmed: "I will not forget the great dream. I will harden my heart."

But something within him burst into song even as he promised. He would see the soft and consoling night shapes —see them, touch them.

He said with gestures: "I am ready to die for the great dream."

The queen removed her flagellum from his forehead. She leaned backward, and a satisfied stridulation issued from her thorax.

THE little worker advanced, picked Atasmas up, and set him gently on its back. For an instant it swayed reverently before the great mother. Then it backed swiftly out of the cell. When it had disappeared through the aperture the queen-preening ant leaped swiftly forward and healed the breach with a glutinous exudate from its swiftly moving mandibles.

The small worker carried its now precious burden up through long tunnels to the surfaec of the earth. At the central entrance of the nest, four great soldier ants with flattened heads moved reverently aside as the solemn pair came into view. The queen mother had laid upon her little emissary a peculiar and sanctifying scent. He was no longer a leader of his little race in the depths. He had become the potential savior of the immense dream; almost an insect in his godlike selflessness and reverent dedication.

He was conscious of immense forces at war within him as he gazed upward at the star-flecked sky. Martial dedication and tenderness fought for supremacy in his breast; an immense, overwhelming tenderness when he thought of the night shapes, a tenderness curiously tempered with superiority and disdain and a sense of loyalty to the dream. The night shapes were glorious, but did not the long night of extinction which would envelop him if he died in defense of the immense dream hold a greater glory?

The small worker turned on its side and Atasmas toppled to the earth. He arose in blinding moonlight, dazed and dazzled by the hard metallic brilliancy of the surface world. He stood waiting, scarcely daring to breathe, as the little worker rose on its hindmost legs and emitted a loud chordotonal stridulation by rubbing its elbowed feelers violently against its shins and abdomen.

For a moment as the queer chafing sound increased in volume, he saw only the towering forms of the soldier ants, dark and glistening in the moonlight, and of the little workers beside him. Then an immense dark form came

sweeping down upon him out of the darkness. It had a wing span of a hundred feet and its barrel-shaped thorax shone with a luster as of frosted silver.

It came to rest a few yards from the earthern entrance with a loud, vibratory thrumming. Instantly the little worker approached and touched the summit of its globular head to the great bulging thorax of the ærial form. The form quivered and grew still.

With competent celerity the small worker picked Atasmas up, carried him to the waiting form, and deposited him gently in a tiny cavity at the base of the creature's abdomen. Touching Atasmas' forehead with its feeler, it spoke to him in rhythmic speech which surged coolly through his brain.

"You will be carried to Agrahan," it said. "It will be a long, perilous flight. If a storm arises on the southern ocean you will emerge and drop swiftly to your death. The great winged one cannot carry you in a storm. If you perish, another spore of flarra-eson will be prepared, and another winged one will carry another of your kind to Agrahan."

"Where is the spore?" asked Atasmas with excited gestures. Only his midget head and shoulders emerged above the dark, hair-lined cavity.

The little worker withdrew a few paces, turned upon its back, and fumbled for an instant with one of its foreclaws in the loose crevices of its underside. When it drew near again to Atasmas it was holding a small metallic cylinder. Atasmas took the cylinder with reverence and thrust it deeply into his gauze-fashioned tunic.

THE SMALL worker touched its head again to the winged shape's thorax. A sudden, convulsive movement shook the great body. It moved spasmodically forward, reared with a roar and soared skyward. Fright and wild elation poured in ripples through Atasmas' brain.

He had never before viewed the kaleidoscopic skies of the surface world from such a perilous vantage point. Looking down, he saw far beneath him the mottled surfaces of earth, and looking up he saw the stars in their remote and awful solitude and the planets in their wheeling courses.

He saw the great white suns that would burn as brightly when the earth was a cinder, and suns that burned no more, but whose light would continue to encircle the pear-shaped universe till the immense bubble burst, and time and space were merged in some utterly stupefying absolute for which neither Atasmas' kind nor the ants had any adequate symbol.

When Atasmas' gaze penetrated to the awful luminous fringes of the spiral nebulæ so great a pall enshrouded his spirit that he presently ceased to stare skyward. Far more reassuring was the checkerboard earth beneath with its dark and glistening lakes, ragged mountains, and valleys crammed with lush and multihued vegetation.

The checkerboard earth was soon replaced by the turbulent waters of the great southern ocean. For thousands of miles Atasmas gazed downward at the shining water, wonder and fear fighting for ascendancy in his little human breast. No storm arose to check the smooth southwarm flight of the great insect.

On and on it flew in the warm darkness, five miles above the turbulent dark sea. Belching volcanoes and white coral shoals passed swiftly before Atasmas' vision. He saw the barnacle colonies in their ocean-breasting splendor, terraces of iridescent shell rising in immense tiers beside the storm-lashed waves.

And suddenly as he gazed, the ocean vanished, and a dark plateau covered with gray-and-yellow lichens usurped his vision.

The great winged one swept down-

ward then. In immense circles it approached the leaden earth and came to rest on a gray, pebble-incrusted plain. For an instant its wings continued to pulsate with a loud, vibratory throbbing. Then the vibrations ceased, and a moist foreclaw arose and fumbled in the cavity where Atasmas rested.

The midget voyager was lifted out, and deposited on the dark earth. As he stood staring wildly about him, a feeler fastened on his forehead.

"I will not return without you, little one," conveyed the great winged shape. "When you plant the spore, come back to me quickly. There is no need for you to die. The spore will blossom without supervision if you plant it in rich, dark soil. I pity you, little one. I wish to help you."

Atasmas was stunned and frightened. He started back in amazement and looked up dimly at the great shape. "Why do you disobey the great mother?" he asked with tremulous gestures.

The winged form said: "We who fly above the earth do not obey the small ethics of your little world of tunnels. We have seen the barnacles in their majesty and the bees in their power, and we know that all things are relative. Go, and return quickly."

ATASMAS went. With the glimmering lights of the enormous hives of Agrahan to guide him, he went swiftly to fulfill his destiny. Over the dark earth he moved, an infinitesimal shape in a world of menacing shadows. And as he advanced the lights of Agrahan grew brighter till he was enveloped in their radiance as in a bath of living flame.

But no one observed him. The sentinel bees were asleep at their posts at the entrance of the central hive, and quickly he passed between their legs which towered above him like pillars of fire in the darkness.

Inside the hive a luminous glow guided his footsteps. Moving with caution he ascended a terminus mound studded with several dozen yawning vents and entered one at random. The branching tunnel in which he found himself bore a superficial resemblance to the subterranean arteries of the ant people.

For hundreds of feet it stretched. Its smoothly rounded earthen walls were gray-green in hue, and it had a flooring of moist, dark loam. Atasmas hugged the walls, taking every precaution to avoid being seen. He was tremulous with apprehension as he moved forward. It seemed incredible that the great central hive should be destitute of life, yet all about him silence reigned. From far ahead a dim bluish radiance illumined the walls of the passage, but no moving shape crossed his vision.

He continued to move forward, little suspecting what lay ahead. The silence remained unbroken, and the only visible shadows were cast by his own insignificant form. It was not until he had advanced far into the tunnel that he encountered the dark mouth of the bisecting passage and the huge shape which filled it.

As the shape burst on his vision he sprang back in instinctive alarm, and a cry tore from his throat. But before he could retreat, the thing was upon him. It fell upon him, and enveloped him.

In frantic resistance Atasmas' little hands lashed out. They encountered a spongy surface bristling with hairs—a loose, gelatinous surface which gave beneath the assaults of his puny fists. Screeching shrilly, the bee larva twined itself about him and pressed the breath from his body. He shrieked and hammered and tore at it with his fingers in an agony of terror. His efforts were of no avail. The bulk of the maggot was too enormous to cope with.

He was dimly aware of a menacing

yellow-lined orifice a yard from his face, spasmodically opening and closing. It drew nearer as he watched it and yawned above him. It twitched horribly with a dawning hunger.

Atasmas lost consciousness then. His senses reeled before the awful menace of that slobbering puckered mouth, and everything went dark about him.

He never knew what saved him until he found himself getting slowly to his feet in a confused daze. The first sight which usurped his blurred vision was the bee larva lurching cumbersomely away from him down the tunnel, emitting shrill screeches as it retreated. Then his gaze fastened in wonder on the night shape.

She stood calmly in the center of the tunnel, a form as tiny as himself, but with a sweetness and grace about her that stirred inexplicable emotions within him. She was holding a long, many-thonged goad, which dripped with nauseaus yellow ichor.

As Atasmas stood staring, his clearing faculties apprehended with uncanny accuracy her true function in the colony of bees. She was obviously a kind of guardian of the large stupid maggot, and the goad in her hands was an implement of chastisement. In defense of Atasmas' little helpless person she had repudiated her function, had flailed the grub unmercifully. It was a triumph of instinctive over conditioned behavior.

IN GRATITUDE and awe Atasmas drew near to her. She did not retreat, but raised the weapon in warning as he moved to touch her. Something snapped in Atasmas' brain. The wonder of her, standing there, awoke a great fire in his breast. He had to touch her, though he died for it.

He touched her arm, her forehead. With a cry of utter dumfounderment she dropped the goad and her eyes widened. Without uttering a sound, Atasmas moved even closer and took her in his arms. She did not resist.

A great joy flooded Atasmas' being. For a moment he forgot the past and the sublime destiny toward which he moved. He stood there in silence, transfigured, transformed.

Then, suddenly, he remembered again. Even as ecstasy enveloped him he remembered the great queen, the nursery artery of the ant people, his selfless function as a servitor in the depths, and the great dream. Deep within him, in the dark depths of his little racial under-mind, the old loyalties flared up.

His hand went to his tunic and emerged with the cylinder. With an effort he tore his gaze from the rapt, upturned face of the night shape and fastened it on the soft loam beneath his feet.

With swift calculation he estimated the depth and consistency of the dark soil. For a brief, momentous instant he seemed to hesitate. Then, with a wrench, he unscrewed the cylinder and released the spore of flarra-eson.

He continued to gaze deep into the woman's eyes in reverence and rapture as the tiny green spore took root, sprouted, and spread out in a dark petrifactive shroud.

Far away the great winged shape waited with thrumming wings as a green growth immortalized two lovers without pain in the central tunnel of the great hive of Agrahan.

The growth spread upward and enveloped the little human forms, darkly, greenly, and so absorbed was Atasmas in the woman in his arms that he did not know that he was no longer of flesh and blood till the transforming plant reached the corridors of his brain and the brain of his companion.

And then the transition was so rapid that he did not agonize, but was transformed in an instant, and remained forever wrapped in glory and a shroud of deepest green.

Then—an explosion that rocked the building.

Gold

Illustrated by Elliot Dold

by Clyde Crane Campbell

SOLOMON NESS slammed the door behind him. The two men sitting at the table in the small room behind the pawnshop started slightly. Grinning triumphantly, Ness threw down a chamois pouch on the crude deal table.

"Again!" Ness announced gloatingly. "Two ounces and six pennyweights. Every day for the past two weeks he's brought in exactly the same amount."

Caine cleared his throat huskily. "Is that why you asked us to come here?"

"Certainly!"

Ness pulled up a chair.

"This guy's name is Lloyd Walsh, about thirty years old, fairly tall, and kind of muscular. But he don't look

like nothing much but a college boy, maybe, or a salesman——"

"Cut the description!" Harding barked.

Ness glanced from one to the other. He saw their hard, sharp faes; he saw greed and impatience, yet he cringed and sought to pacify them. They were money. Ness had money, but he wanted to *be* money, and they could make him so.

"Well, every day he gives me a lump of gold—two ounces and six pennyweights of it—and I give him six tenspots. Then he goes out without saying a word."

Caine pursed his lips tightly. He glanced at Harding and back again at the chamois pouch. "Is it good gold?" he grated.

"What do you think?" Ness was offended.

With fumbling fingers he untied the knot and emptied the pouch onto the table. A gleaming, perfect cube of yellow metal dropped out. He pulled out a ring of thin spatulas, fastened like keys to the ring, and rubbed three of them on a black piece of slate. They left yellow marks, varying in heaviness.

"You know the test for gold," Ness said. "The purer the metal is, the heavier the mark it leaves. Twenty-four-carat gold smears like butter. This is twenty-four carat." He pressed the last spatula on the slate and rubbed lightly.

"Now," he said, drawing the block of gold across the bottom of the slate.

It left a thick streak. Harding and Caine twisted uneasily in their straight-backed chairs and pursed their thick lips more tightly.

The bold streak leered at them. All three had an inordinate fondness for all sorts of money, but this was gold. And gold was more than money—it was power, and its touch was luxurious and caressing. Gold was beauty concentrated that a man might grasp it and fondle it.

"It's absolutely pure," Ness whispered, as befitted a hymn in praise of the god. "There isn't a grain of anything but gold."

With a new reverence they caressed it with their eyes.

"Where does he get it?" Caine asked.

Ness spread his thick hands palm upward on the table and added a shrug to express his complete lack of knowledge.

"Well, where *can* he get it from?" Harding demanded impatiently.

Fishing a cigarette and match from his wrinkled jacket of shiny black alpaca, Ness cocked a quizzical eye at the two burly money men.

"I had him trailed for three days," he said at length. "He's got the entire third floor of a factory building on Fourth Avenue, not far from 23rd Street. He lives there. Got a whole mess of machinery in the loft, enough to fill a power plant.

"We checked up on his mail. He don't get no packages at all and mighty few letters. When he does go out, he drifts over to the Mechanics' Library. No friends in the city. Hardly goes out, and, when he does, he either drops in at the library, or brings his two ounces and six pennyweights of gold to me."

Caine drummed on the table. "But where *does* he get it?" he insisted.

"You know as well as I do." Ness waved his hand vaguely.

Harding looked a little bewilderedly at the cube of pure gold. He raised his eyebrows and shrugged his shoulders.

"I'm not a scientist or a mathematician," Caine said. "But I can put two and two together, and I see only one answer."

Hopefully, the others looked toward him for the solution.

"He makes it!" Caine said.

Ness and Harding cackled depressingly. Angrily, Caine jumped to his

feet and pounded the table with his fat, white hand.

"Laugh, you idiots!" he bellowed. "I say he makes it!"

Ness quieted down at the vehemence of Caine's insistence. "What makes you so sure?"

"It stands to reason, don't it? He comes in here with two ounces of solid, pure gold that he don't get in the mail, or from any one else. He's got a whole floor of a building stuffed with machinery. He knows chemistry and physics and all that stuff. What's to prevent him from making gold?"

The two others sat silent, numbed by Caine's logic. Harding cocked his huge bald head to one side and thoughtfully studied the little cube of perfectly pure gold. His over-red lips were tightened painfully.

"Maybe he's right," he said to Ness cautiously. "We can find out easy enough."

CONCRETE FLOORS are hard. A truism, Lloyd Walsh thought, and one of the more unnecessary ones; nevertheless, concrete was hard on the feet, he had to admit to himself, particularly when he had to dash about from one machine to another without ceasing.

He forced himself to plod from machine to machine, knowing he was too tired to exert the amount of speed necessary to gain success. Though his feet ached interminably, though his hands shook with nervous exhaustion, and his eyes were nearly blind with strain, he plodded on and on.

His lungs pumped furiously in the ozone-filled air; his eyes smarted and his nose burned incessantly with the sharp gas. And his knees wabbled so that he bumped into machines he could not see. Automatically he poured oil into grooves and pockets, and opened and closed circuits, adjusted pressure gauges, and kept increasing the power. Pressure and superheat piled unbelievably high.

Tired—tired!

His nerves screamed for rest; yet he forced himself to go on and on, until everything was a black haze of constant motion, and still he staggered from machine to machine, pouring his oil and opening and closing circuits.

Two hours went by—no one could know how slowly—before he was permitted to open the pressure box and strain his protesting eyes in the gloom at the cube of white-hot metal. Carefully, he picked up the glowing cube with long tongs, and tossed it into a pail of iced water. Sizzling, steaming, the water boiled instantly.

Walsh dropped heavily into a chair. He could not force himself to move, even to look at the result of his heroic labor. Just to sit there and not move, though he breathed with great effort the blinding, choking ozone, was gratifying.

He clutched his head wearily with his shaking hands. "There's no use going on," he thought. "I can't work fifteen hours a day, doing the work of three men, without breaking down—perhaps losing the whole thing by my idiotic suspicions. I can't go on! I can't! I'm killing myself! If I could only trust somebody——"

He fell asleep in the stiff-backed chair and awoke in the morning, stiff in every joint, to find himself lying uncomfortably on the cold floor.

All day he sat, without eating or moving or thinking; just sitting stupidly—numb.

It must have been about six o'clock in the evening, he thought, when he made himself leave his chair and examine the cube of cold metal. There were little spheres of dull metal lying inertly at the bottom of the pail and nothing else in the clear water.

Lloyd Walsh recognized defeat. The breaking point had come at last, he was

forced to admit to himself; still the blow ached in his numb brain.

Defeat—the breaking point—just as success was so near!

He dropped into the chair and covered his face with his tired hands. He might have slept or fainted, it might have been anything, but the next thing he was conscious of was a shy young chap standing nervously before him. Walsh started and hopped to his feet.

"I—I rang the bell," the other explained hastily. "There was no answer so I tried the door, and it was open, so I walked in."

"What are you doing here?" Walsh demanded.

The other shifted embarrassedly from one foot to the other. "I came here for a job. I heard you had a lot of machinery here and I'm a mechanic —an electrical mechanic," he blurted out.

Walsh's eyes narrowed suspiciously. "Who told you I had machinery here?"

"I was making the rounds of the buildings," the young mechanic rushed to explain, more confused than ever. "I was looking for work, and the men downstairs told me they heard your machinery up here. So I came up to see if you had anything for me."

To Walsh the appearance of the young mechanic seemed providential, but his ever-present suspicions refused to die.

"What's your name and where did you work before?" he asked.

"Herbert Benton. I—well, I was doing part-time work for the New Jersey Power Co. It was routine work and—well, I suppose I was crazy, but I wanted to do big things, like experimentation and all that sort of thing. So I left and started looking around for other kinds of work—stuff that would give me a chance to use my head instead of taking orders all the time."

"What kind of work did you want to do?"

Benton leaned forward seriously. "I always wanted to try to make a fuel battery, but I never had the time to work on it. And improve power transmission, like carrying big loads on thinner cables, and making a narrow-beam radio transmitter that would send loads of energy——"

Walsh leaped to his feet and grasped Benton's arm. "You—you really wanted to do all this?" he gasped, astounded at the magnitude of the work the boy had set himself to attempt.

Benton nodded bashfully.

"Where did you get these ideas?" Walsh insisted. "In school? Have you done any work on them at all?"

FLATTERED by Walsh's interest, Benton held nothing back.

"I got most of them in school," he admitted. "It was while we studied electrical transmission that I got my first idea. Of course you know that in a power cable the particles of electricity collide with the molecules of the wire and transfer their positive charge; when the molecules of copper collide with other particles of electricity they lose their positive charges to the electrical molecules.

"Now, if I could direct a tight beam —a narrow radio beam—to a receiving set some distance away, I could ionize the air, which would transfer the particles of electricity from one molecule to another in the same way as a power cable does. In that way I could save the cost of cables."

Walsh sat silent, digesting the idea. "But there would be a considerable loss of energy by the evaporation of electrons from the ionized beam of air, particularly if the temperature was high."

"Well, that's true to a certain extent, but consider this: A high-tension cable will be heated quite a bit by its load and the resistance of the copper," Benton objected. He seemed to know the subject well. "In that case there is a dis-

charge of negatively charged electrons from the hot wire, and the larger the load the greater the discharge, since a rise in temperature increases the discharge, as you mentioned.

"So the load you can convey is pretty well limited, unless you want to string enormously thick cables around the city, and you know the cost of that. In my narrow beam, you can widen or narrow the beam, and make it a thin or thick cable of ionized air, according to the load you want to take."

"Right!" Walsh cried, excited with the idea. "And that practically does away with Ohm's law, you know. The passage of electrons through the ionized air would encounter almost no resistance, so, besides saving the loss of energy through the evaporation of electrons that'd ordinarily take place in a high-tension cable, you'd be relieved of the loss of power due to the resistance of the cable. That should be every bit of twenty-five per cent more energy transmittable."

Benton sat down on the edge of a chair and squirmed happily on it. He could hardly contain himself. "My mother doesn't understand my ideas," he confided, "but she does the best she can to help me, like buying parts of machinery for me. Naturally, the stuff costs more than she can afford, and I can't do as much work as I want to do. But it's more than I could do in the power house," he added impetuously.

"I understand that," Walsh commented sympathetically. "I went through the same difficulty until I found out how to make——" He broke off suddenly. "You couldn't do much with the salary you got?"

Benton shook his head. "We needed every penny at home."

"Listen," Walsh bent forward eagerly, "I'll let you help me, but you won't get much money for it. What I will give you, though, is all the machinery and technical help you need. You can live here with me or stay at home with your mother. Either way is all right with me, but you'll get home pretty late at night, because I generally drive myself ten to fifteen hours a day, or more."

"I'll stay here with you, of course."

"Good! I'll show you what to do as soon as you're ready."

"Gosh, thanks! I—I don't know how to thank you." Benton seemed genuinely moved. "May—may I call up my mother and tell her?"

Walsh silently pointed to his tiny living quarters at the end of the loft. Deliriously happy, Benton dashed off to the telephone.

Walsh stared after him.

He turned back to survey his vast room filled with makeshift machines. Everything would be all right now; he wouldn't have to kill himself with work.

Benton, however, closed the door slowly, peered through the narrowing crack to make certain Walsh intended staying in the loft. Hastily he picked up the telephone and dialed a number, trembling with nervous excitement.

"Hello, Ness?" he spoke softly and rapidly, his mouth close to the transmitter. "Listen—let me talk, will you? I got in with Walsh all right. . . . No; he has no suspicions. . . . Will you shut up and let me talk? He made a slip while he was talking to me. He makes the gold. Oh, there's no doubt about it; he practically told me himself. . . . What's that? Find out as much as I can and hang on until we can blow the place over? Right!"

BENTON made excellent progress during the next week, both in his work and in his relationship with Walsh, who admired intensely his ambition and ability to grasp the routine. No important suggestions came from him, but then Walsh did not expect him to grasp the technical intricacies for a considerable time.

At first Benton was permitted to touch only certain machines and witness the entire process, all but the final step. Not that Walsh did not trust him; it was simply his suspicious nature, always involved where his invention was at stake. In so far as trust entered into it at all, Benton knew more about the process than any man alive, with Walsh's exception. Still, Walsh wanted more time before allowing him to know the whole secret. He watched the unsuspecting boy with never-failing closeness.

Thus when it came time to open the pressure cask, he sent the boy out on various errands, or asked him to do unnecessary work around the room they lived in; pretexts that would be apparent to all but this unworldly lad, he felt sure. As soon as Benton was out of the room, he switched off the lights, leaving only a small lamp burning near the pressure cask, and screened himself off from the end of the room by the bulky shoulder of the machine.

Now there never was failure; the lump of gray metal Walsh placed in the cask three hours before always became a cube of pure yellow gold. More than that, he found himself able to work the entire morning and most of the afternoon on his important experiment, and save the routine production of gold for expense money until the last three hours of the day, without tiring himself or the boy.

Walsh's treatment of Benton caused him a twinge of honest conscience. He had promised to permit him to work on his original experiments with the conduction of electricity, but he found he required his assistance too often to give him any time to himself. What was worse, though, was that he paid him very poorly, scarcely compensating Benton for the amount of really hard work he did.

He could not pay Benton much, neither could he give him any time to conduct his experiments in wireless transmission of energy. Then what could he do to repay him? Walsh asked himself. There was only one answer—take him into his confidence. Sooner or later it would have to be so. Actually he could find little reason for his suspicious and undeserved treatment of the boy. Before long he would be unable to handle the work alone. Then there would be no choice.

"Benton!" he called.

The machines were silent. His assistant approached quickly.

"I'm taking you into my confidence, Benton," Walsh said impetuously. "I suppose you know I'm able to make gold?"

Benton hesitated. Was it better to feign ignorance or tell the truth? "I was wondering what we were doing," he replied evasively.

Now it was Walsh's turn to hesitate. Clearly, though, it was too late to back out; the secret, or part of it, was told, and nothing remained but for him to tell the rest. Leaning nervously against the huge rounded shoulder of the compression-superheat machine that concealed in its heart the pressure chamber, he fumbled for words:

"Gold is not everything——" No; that would not do.

"We are working for humanity rather than gain——" Too smug, and it was beating all around the subject, instead. Come to the point.

"Listen, Benton," Walsh gripped tightly the assistant's left shoulder, "it's come to a point where I can't work on alone, I must have help and help that understands perfectly what I'm doing. I told you I make gold, and it's true; but what's more important than that is we're making gold only for expense money—to make possible the really momentous work we've set ourselves to do. We're not working to make ourselves rich. That wouldn't satisfy me, and I hope it wouldn't satisfy you.

"You can't realize how difficult it is to tell some one else the dreams you've cherished secretly for years and years." Walsh felt slightly dizzy and released Benton's shoulder and sat down. "Do you know what money is? Oh, you probably know the old economic definition—gold is a medium of exhange. It's true, of course, but a medium of exchange for what?

"At one time foods just grew, requiring practically no attention from the owner; you had sheep and I had cattle; I was tired of beef, wanted mutton, and you wanted beef, so we exchanged. Then we both wanted vegetables from some one who was fortunate enough to have them growing on his land.

"We dragged our respective live stock to him and bartered. But needs grew; new luxuries developed, like bows and arrows, sharp metal knives, and so on. Obviously we could not drag our live stock from one place to another. Mediums of exchange arose—crude iron bars, copper, wampum, beads of pretty stone, gold and silver.

"For thousands of generations we bought foodstuffs and adornments for the houses we owned, all brought forth in the most leisurely manner. Then a change came—machinery was invented. Needs increased rapidly. I produced only one thing and needed to buy from others who each produced only one thing. And everything represented so much energy—so much energy to grow a field of wheat, so much energy to make clothes, to make this, to make that, and to light and heat the apartment I lived in—some one else's house—while working for somebody else.

"All these represent energy, and gold buys energy. If I could produce enough gold, we could all live—theoretically—like kings, with sufficient energy at our command to buy all we needed with all the gold we possess. But then the amount of gold would be more than the amount of energy, and gold would be worthless. So we would substitute another precious metal that would be rarer than energy, and we'd be on a different standard and no better off, except for the fact that all savings of gold would be wiped out.

"Now," he breathed hard, watching intently Benton's shining eyes, "suppose I was able to liberate enough energy to make it too cheap to buy? Do you know what that would be? The true solution of the economic problem. Liberate enough energy to serve all the people instead of only a few, and you can do anything, make anything, and so cheaply that there's nothing on earth worthless enough to pay for it in its real value."

BENTON sat quietly, thoughtfully stroking the shoulder of the machine that dared attempt to solve the problems of the world. "You'd make energy the medium of exchange?" he asked.

"No, no! Wipe out every medium of exchange, do away with gold, with capital, with buying power. I'd make things so cheaply there'd be nothing cheap enough to pay for them; nothing to do but to give them away, and that province would be the government's."

"Communism!" Benton blurted out.

"Let it be known as communism, if you want to call it that. Or you can call it a perfect democracy, the only perfect democracy the world has known; each person possessing the right to as much energy as his neighbor, and doing his share to release the requisite amount needed to provide himself with the right to possess energy, instead of working away his life to gain a particle of the amount he should have."

He stabbed his finger at Benton. "Why did you want to supply a cheaper method of transmitting energy?" he asked. "Did you want to get rich? Yes; partly that, but behind it was the vague desire to aid humanity, and our inventions together—mine to make en-

ergy so cheap that there is nothing cheap enough to pay for it, and yours to transmit it almost without loss—would not only revolutionize the world, but would give it the real solution of its problems.

"Imagine this: You want to experiment and, instead, find it necessary to work for a living, which means enough to feed, clothe and shelter yourself. The pleasures of life—the more subtle pleasures, all demanding an expenditure of some sort of energy or other—are not yours; for one thing, you don't want them particularly; more especially, you can't afford them. All you want is the chance to experiment, and our system of society, which insists that you do some work you don't want to do, won't permit you.

"Then everything is changed; by working perhaps an hour a day, doing some routine work more for the sake of doing some kind of work than for any special necessity, you can provide yourself with enough energy to allow you to devote your life to any other kind of research work or art.

"Parts of machinery—all you want and need—are yours for the asking, since they are produced so cheaply that the one hour a day you work at your routine job more than covers your demands on the public supply of energy, and twenty-three hours of leisure provide the time you need to devote yourself to your chosen task.

"Unlimited, costless energy supplies all this and more: education and higher education at no cost; culture at your own leisure; entertainment with no limit of energy to check it; a full day, less one hour, to apply to the arts; and the one thing every person seeks—security.

"The old struggle for security may be interesting; some think it is the only thing that makes life worth while; but our régime would be more mature, more full of seeking for the truly important things of life, rather than food, clothing, and shelter, and a comfortable old age with rocker, pipe, or knitting needles."

Benton walked slowly to the window and stood looking out at the lunch-hour crowds. "You're right," he said deeply, thoughtfully; "automobiles, airplanes, steamships, food, clothing, shelter, warmth—all these things are energy—life, itself, is an energy concept, and gold can buy all these things." He wheeled savagely. "But energy should serve life, instead of life serving energy. Wipe out gold—the symbol of energy—and you wipe out evil."

"Well," Walsh returned calmly, "you're attacking the problem from the wrong end. Supply energy without limitation and gold becomes worthless; useless for implements and no longer attractive as an ornament. There can no longer be stealing, because everything is free, and your neighbor is able to pile up stuff as well as you; besides, there's no point in cluttering up your house with things for your old age—you can get them at any time you want them."

BENTON paced up and down, his hands stuffed in his pockets. The idea excited him unbearably. "How can you release so much energy?"

"The truth is," Walsh admitted, "I can release it, but I can't seem to harness it yet. Perhaps both of us can work out that problem. But the sun, you know, burns with the equivalent of a hundred million tons of coal a minute and shows no signs of burning itself out. The explanation is this: hydrogen has an atomic weight of 1.008; helium an atomic weight of 4 flat. The theory is that four hydrogen atoms form one helium atom, thus releasing .032 of an atom of energy.

"However, to build up four hydrogen atoms to one helium atom and release the .032 would require an amount of physical pressure, superheat, and elec-

trical pressure of more than half a billion volts, which is much more than I could possibly attain. But suppose I break down one hundred and twenty-five atoms of helium—that *should* produce a thousand atoms of hydrogen.

"It wouldn't, though. Eight thousandths part of every hydrogen atom formed would be released as pure energy.

"Here's how I go about it, and the production of atomic energy is by precisely the same method. I inclose a block of lead in a pressure cask that is able to yield a force of a hundred thousand pounds to the square inch and can be heated simultaneously to three thousand degrees centigrade. Then, from six openings, one on each side of the cube, I bombard the lead with alpha rays, emitted by radium, separated from the beta and gamma rays and concentrated and focused—that's the thing that's held up the release of atomic energy until now. That's half the secret.

"Now, alpha rays are positively charged helium atoms and travel at a rate of 10,000 miles per second. When they collide with another atom, negatively charged, there is a tremendous transmission of energy. The alpha rays smash into the lead. They knock off electrons and protons from the lead atoms until the atomic weight is down to that of gold."

Benton whistled in awe. "How can you figure that out?"

"Well," Lloyd Walsh waved toward a clock set in the machine, "that's about the only way I have. You see," he bent forward eagerly, "this is more or less of a hit-or-miss proposition. Electrons—even atoms—are submicroscopically small things, you know, and to hit them is a matter requiring extreme patience, but if you bombard lead long enough—about three hours generally, if the charge of alpha rays is large enough and concentrated and covers all parts of the lead—you can be fairly certain you'll hit most of them, and those you don't hit will be hit by other electrons smashed and recoiled out of their orbits.

"The atomic weight of lead is 207.2 and that of gold is 197.2. Knock ten electrons out of their orbits and you have gold——"

"But how do you get the pressure and heat," Benton interrupted, "and why do you require to have them?"

Walsh strode around the machine, followed by his assistant. "I have the inside of the machine filled with water, surrounding the pressure chamber. Pressure applied to an inclosed fluid is transmitted equally, without diminution, to all parts of the fluid. If I can have springs and straight-arm joints, a thousand of them, all yielding a pressure of a hundred pounds to the square inch, I get my hundred thousand pounds to the square inch. Take a look at the machine."

Benton examined it closely. It was a great sphere suspended three feet above the floor, surrounded by a bewildering maze of short, thick springs and straight-arm joints that could be straightened very slowly, and each anchored to a massive bulwark, something like the cushion at the end of a subway track.

Walsh stood in the narrow aisle leading to the door of the pressure chamber between the first rows of springs and forced down a lever. With a startlingly quick motion and a scream of tortured steel, the springs darted forward and half disappeared into the body of the machine.

"That gives a pressure of fifty thousand pounds to the square inch immediately," Walsh bellowed above the roar of the motors and dynamos. "If I straightened the other joints at once, the machine would be torn to pieces under the strain. But slowly, over a period of half an hour, I increase the

pressure by straightening the joints little by little.

"Inside the cask is an electric furnace, lining the chamber. It's no difficult feat to get three thousand degrees centigrade —any dental mechanic can do it with his furnace.

"The combination of superheat and vast pressure condenses the metal so, the atoms are forced more than four thousand times more closely together than normally. This reduces the difficulty in smashing the electrons out of their orbits."

"And the energy liberated?" Benton rasped harshly.

"A glass of water would carry a steamship across the Atlantic."

BENTON found a pretext for rushing out of the loft. His conscience, which was always strong but had been until this time lulled by necessity, was giving him trouble now. At the corner drug store he frantically dialed Ness' phone number; there was no answer.

In a taxi he careened madly to the store. It was locked. He was frenzied, realizing Ness, Harding, and Caine had lost patience with him and had determined to take matters into their own hands, regardless of the progress he had made in discovering Walsh's secret.

The future—"progress of humanity" —"gold in itself is worthless, only as a medium of exchange for energy——"

And they could produce energy so cheaply there was nothing worthless enough to pay for it!

IT WAS NINE o'clock in the morning. He—it could have been Benton—had eaten an automatically prepared and served breakfast, and now he left the alabaster-white community house, one of many beautiful dwellings that rose in loveliness toward the sky. Intoxication was in the air; perhaps it was simply spring; more particularly it was an undeniable sensation that life was worth living.

It was worth while. Consider this, he said to himself—in half an hour he was to begin the one short hour of routine work that constituted his entire working day, and he had given himself twenty more minutes than necessary. He could stand idly on the moving streets, breathing meanwhile the fragrant perfume of the spring air, unspoiled by various fumes.

There were clean streets and filtered air; no sense of flutter and bustle; though occasionally a plane darted hurriedly across the sky; others ambled in a leisurely manner to their destinations. Certainly everything must be done, but leisure was too precious a thing to destroy in mad pursuit of vain enjoyment. Buildings harmonized in shape and color with their neighbors; from earth they were lovely enough to look upon; from the sky their exquisite color patterns were unspeakably lovely.

There were ornate palaces of intricate pleasures, and there were simple athletic games for exercise alone; speed was not encouraged, but sometimes one craved for adventure and a strong thrill to wash ennui from the veins. Palaces of pleasure and knowledge, these went together well, for one without the other would be futile or intolerable.

Everything for human comfort and enjoyment was free for asking—food, clothing, shelter, warmth, knowledge, culture, leisure, pleasure, speed.

And above all the buildings arched the energy beams invented in the twentieth century by Herbert Benton.

Best of all was the feeling of security and independenc, of coming and going as he pleased, after performing his trifling task of one hour a day. To that extent he was obligated to society, but no more than society was obligated to him.

Now he was leaving the suburbs and entering the city. True, the buildings

were not as daintily lovely as the residences, yet in a powerful way they demonstrated their strength to provide for civilization.

He neared a machine shop and edged to the slower ways to get off and order parts sent to his private laboratory. As he stood and fondled the perfectly cut parts, he knew happiness. There was no loneliness, for his friends numbered hundreds; no boredom, though occasionally he was tired after successfully completing an experiment, for his mind had to be cultivated and knowledge sought, and there were numerous ways of relieving physical exhaustion. And he could work or play as he wished, with no one to demand that he earn bread by sweating twelve hours.

These things, and more, might have been——

THROUGH the window as the cab careened insanely around the corner, Benton glimpsed Ness, Harding, and Caine striding purposefully into the building. They looked menacing. Benton quivered with rage and anxiety.

A moment was wasted in paying the driver and another in waiting for an elevator. Then the three were upstairs. Something was bound to happen when they clashed with Walsh. Benton dashed wildly through the corridor around to the back entrance. Perhaps there was still time——

He opened the door of the loft slowly and crawled out on hands and knees. The shoulder of the machine, he knew, would hide him from view.

"Benton double-crossed us!" he heard Ness grate harshly. "Well, we got guns, and we won't mind using them on you if you don't come across and tell us how you make gold."

Benton peered around the machine. The three stood threateningly, revolvers held expertly before them, pointing at Walsh, who stood calmly—silently——

Benton ignored them, though his hands shook with impatience and nervousness. He heaved at a cameralike attachment mounted on a crane that was forced into an opening near the pressure chamber. It swung back slowly. He straightened it up above the shoulder.

"Stand back, Walsh!" he cried.

Walsh leaped to one side.

"So you double-crossed us, eh?" Harding roared.

"What the hell is that?" Caine demanded, smiling at the thing pointed at them. It resembled a floodlight.

"Concentrated alpha rays. Throw down your guns, or I'll blow you all over the city."

For answer, the three sneered, aimed their guns at the machines and stepped forward.

"Turn it on!" Walsh bellowed.

Without becoming too involved, this is what happened:

For the first time in history, alpha rays, concentrated and amplified, collided with the free and combined hydrogen atoms in a human body. More than half the body is composed of water; the hydrogen atoms were knocked out of combination with oxygen atoms, and at first they appeared like dried, withered apples, for a brief second. Then an explosion that rocked the building blew them into fragments. Ergs liberated: 2,000,000 at the very least.

They drove their fields of force against the fivefold bars.

The Skylark of Valeron

Part Six—Seaton strikes back, and builds the mightiest Skylark of all!

by Edward E. Smith, Ph.D.

Illustrated by Elliot Dold

UP TO NOW.

Richard Seaton liberates the intra-atomic energy of copper. He and Martin Crane build a space ship, "Skylark of Space." Brookings, head of the World Steel Corporation, tries to steal the invention. Failing, he calls in DuQuesne, an unscrupulous scientist who succeeds. DuQuesne builds a space ship from the stolen plans and abducts Dorothy Vaneman, Seaton's fiancée, and Margaret Spencer. Out of control, his ship drives through space until her copper is exhausted.

Seaton and Crane follow DuQuesne by means of an "object-compass" focused upon him. They effect a rescue, but their fuel runs low. Several planets are visited, one of which had been materialized by a group of purely intellectual beings. Escaping from these entities, they fly toward a cluster of green suns.

They land upon Osnome and are of service to Kondal, a nation of that world, against Mardonale, its other nation.. Seaton marries Dorothy, Crane marries Margaret. They return to Earth, DuQuesne escaping just before landing.

Summoned by Dunark of Osnome, the Terrestrials return there in "Skylark Two." On the way they meet and defeat a war vessel of the Fenachrone, a monstrous race of vast scientific ability whose goal is universal conquest. In search of a science equal to that of the Fenachrone Seaton visits Urvania, a planet then at war with Osnome; Dasor, a watery world inhabited by a race of almost amphibious humanity; and finally Normalin, where he finds the science he is seeking.

Rovol, First of Rays, and Drasnik, First of Psychology, each impress upon Seaton's brain all of his own knowledge. They build a fifth-order projector and destroy all the Fenachrone vessels in space save one, which has left this Galaxy entirely. "Skylark Three" is built, and Seaton sets out after the fleeing vessel, emerging victorious from a titanic battle.

DuQuesne and Loring, his assistant, visit Norlamin, where they pretend to be Seaton's employees and persuade Rovol to build them a duplicate of "Skylark Three." They set out, supposedly to aid Seaton, but they double back to Earth, where DuQuesne makes himself the undisputed master of the planet.

Seaton succeeds in generating waves of the sixth order and learns that thought lies in that level.. "Three" is attacked by the purely intellectual entities. To escape from them Seaton rotates "Skylark Two," which has been carried as a lifeboat, into the fourth dimension, finding it a peculiar region indeed.

Back in ordinary space, Crane discovers that they are so far away from the First Galaxy that an object-compass fo-

cused upon its entire mass fails to register. To find their way back they must build a sixth-order projector. They fly to the nearest Galaxy and seek out, by way of projection, a solar system as nearly as possible like our own.

In that system they find an interloping planet having an atmosphere of chlorin. They find an Earthlike planet and learn that its people, scarcely recovered from the devastation of their world by a near-collision of suns, are being wiped out by the inhabitants of that foreign, chlorinaceous planet which their sun had taken on, in passing, from the other.

Quedrin Radnor and Klynor Siblin, scientists of Valeron, attempt to defend their world against the Chlorans. Siblin is captured, taken to Chlora, and sent back with a message—slavery or death. Radnor attacks Chlora's capital, but is repulsed. The people of Valeron muster their every resource against the invaders, but their fortifications are being melted down by the forces of the enemy.

XX.

VALERON was making her last stand. Her back was against the wall. The steadily contracting ring of Chloran force had been driven inward until only one thin line of fortified works lay between it and the great dome covering the city itself. Within a week at most, perhaps within days, that voracious flood of lava would lick into and would dissolve that last line of defense. Then what of Valeron?

All the scientists of the planet had toiled and had studied, day and night, but to no avail. Each new device developed to halt the march of the encroaching constricting band of destruction had been nullified in the instant of its first trial.

"They must know every move we make, to block us so promptly," Quedrin Radnor had mused one day. "Since they certainly have no visiray viewpoints of material substance within our dome, they must be able to operate a spy ray using only the narrow gravity band, a thing we have never been able to accompilsh. If they can project such viewpoints of pure force through such a narrow band, may they not be able to project a full materialization and thus destroy us? But, no, that band is—*must* be—altogether too narrow for that."

Stirred by these thoughts he had built detectors to announce the appearance of any nongravitational forces in the gravity band and had learned that his fears were only too well founded. While the enemy could not project through the open band any forces sufficiently powerful to do any material damage, they were thus in position to forestall any move which the men of Valeron made to ward off their inexorably approaching doom.

Far beneath the surface of the ground, in a room which was not only sealed but was surrounded with every possible safeguard, nine men sat at a long table, the Bardyle at its head.

"—— and nothing can be done?" the coördinator was asking. "There is no possible way of protecting the edges of the screens?"

"None." Radnor's voice was flat, his face and body alike were eloquent of utter fatigue. He had driven himself to the point of collapse, and all his labor had proved useless. "Without solid anchorages we cannot hold them—as the ground is fused they give way. When the fused area reaches the dome the end will come. The outlets of our absorbers will also be fused, and with no possible method of dissipating the energy being continuously radiated into the dome we shall all die, practically instantaneously."

"But I judge you are trying something new, from the sudden cutting off of nearly all our weight," stated another.

"Yes. I have closed the gravity band until only enough force can get through to keep us in place on the planet, in a last attempt to block their spy rays so that we can try one last resort——" He broke off as an intense red light suddenly flared into being upon a panel. "No; even that is useless. See that red light? That is the pilot light of a detector upon the gravity band. The Chlorans are still watching us. We can do nothing more, for if we close that band any tighter we shall leave Valeron entirely and shall float away, to die in space."

As that bleak announcement was uttered the councilors sat back limply in their seats. Nothing was said—what was there to say? After all, the now seemingly unavoidable end was not unexpected. Not a man at that table had really in his heart thought it possible for peaceful Valeron to triumph against the superior war craftiness of Chlora.

They sat there, staring unseeing into empty air, when suddenly in that air there materialized Seaton's projection. Since its reception has already been related, nothing need be said of it except that it was the Bardyle himself who was the recipient of that terrific wave of mental force. As soon as the Terrestrial had made clear his intentions and his desires, Radnor leaped to his feet, a man transformed.

"A laboratory of radiation!" he exclaimed, his really profound exhaustion forgotten in a blaze of new hope. "Not only shall I lead him to such a laboratory, but my associates and I shall be only too glad to do his bidding in every possible way."

FOLLOWED closely by the visitor, Radnor hurried buoyantly along a narrow hall and into a large room in which, stacked upon shelves, lying upon benches and tables, and even piled indiscriminately upon the floor, there was every conceivable type and kind of apparatus for the generation and projection of etheric forces.

Seaton's flashing glance swept once around the room, cataloguing and classifying the heterogeneous collection. Then, while Radnor looked on in a daze of incredulous astonishment, that quasi-solid figure of force made tangible wrought what was to the Valeronian a scientific miracle. It darted here and there with a speed almost impossible for the eye to follow, seizing tubes, transformers, coils, condensers, and other items of equipment, connecting them together with unbelievable rapidity into a mechanism at whose use the bewildered Radnor, able physicist though he was, could not even guess.

The mechanical educator finished, Seaton's image donned one of its sets of multiple headphones and placed another upon the unresisting head of his host. Then into Radnor's already reeling mind there surged an insistent demand for his language, and almost immediately the headsets were tossed aside.

"There, that's better!" Seaton—for the image was, to all intents and purposes, Seaton himself—exclaimed. "Now that we can talk to each other we'll make those jelly brains hard to catch. They'll think they've got hold of a wild cat by the tail pretty quick now, and they'll be yelling for help to let go."

"But the Chlorans are watching everything you do," protested Radnor, "and we cannot block them out without cutting off our gravity entirely. They will therefore be familiar with any mechanism we may construct and will be able to protect themselves against it."

"They just think they will," was the grim response. "I can't close the gravity band without disaster, any more than you could, but I can find any spy ray they can use and send back along it a jolt that'll burn their eyes out. You see, there's a lot of stuff down on the edge of the fourth order that neither

you folks nor the Chlorans know anything about yet, because you haven't had enough thousands of years to study it."

While he was talking, Seaton had been furiously at work upon a small generator, and now he turned it on.

"If they can see through *that,*" he said, "they're a lot smarter than I think they are. Even if they're bright enough to have figured out what I was doing while I was doing it, it won't do them any good, because this outfit will scramble any beam they can send through that band."

"I must bow to your superior knowledge, of course," Radnor said gravely, "but I should like to ask one question. You are working a full materialization through less than a quarter of the gravity band—something that has always been considered impossible. Is there no danger that the Chlorans may analyze your patterns and thus duplicate your feat?"

"Not a chance," Seaton assured him positively. "This stuff I am using is on a tight beam, so tight that it is absolute proof against analysis or interference. It took the Norlaminians—and they're a race of real thinkers—over eight thousand years to go from the beams you and the Chlorans are using down to what I'm showing you. Therefore I'm not afraid that the opposition will pick it up in the next week or two. But we'd better get busy in a big way. Your most urgent need, I take it, is for something—anything—that will stop that surface of force before it reaches the skirt of your defensive dome and blocks your dissipators?"

"Exactly!"

"All right. We'll build you a four-way fourth-order projector to handle full materializations—four way to handle four attackers in case they get desperate and double their program. With it you will send working images of yourselves into the power rooms of the Chloran ships and clamp a short circuiting field across the secondaries of their converters. Of course they can bar you out with a zone of force if they detect you before you can kill the generators of their zones, but that will be just as good, as far as we're concerned—they can't do a thing as long as they're on, you know. Now put on the headset again and I'll give you the dope on the projector. Better get a recorder, too, as there'll be some stuff that you won't be able to carry in your head."

The recorder was brought in and from Seaton's brain there flowed into it and into the mind of Radnor the fundamental concepts and complete equations and working details of the new instrument. Upon the Valeronian's face was first blank amazement, then dawning comprehension, and lastly sheer, wondering awe as, the plan completed, he removed the headset. He began a confused panegyric of thanks, but Seaton interrupted him briskly.

"'Sall right, Radnor, you'd do the same thing for us if things were reversed. Humanity has got to stick together against all the vermin of all the universes. But, say, I'm getting a yen to see this mess all cleaned up, myself—think I'll stick around and help you build it. You're all in, clear to the neck, but you won't rest until the Chlorans are whipped—I can't blame you for that, I wouldn't either—and I'm fresh as a daisy. Let's go!"

IN A FEW hours the complex machine was done. Radnor and Siblin were seated at two of the sets of controls, associate physicists at the others.

"Since I don't know any more about their system of conversion than you do, I can't tell you in detail what to do," Seaton was issuing final instructions. "But whatever you do, don't monkey with their primaries—shortening them would overload their liberators and blow this whole Solar System over into the next Galaxy. Take time to be dead sure

that you've got the secondaries of their main converters, and slap a short circuit on as many of them as you can before they cut you off with a zone. You'll probably find a lot of liberator-converter sets on vessels of that size, but if you can kill the ones that feed the zone generators they're our meat."

"You are much more familiar with such things than we are," Radnor remarked. "Would you not like to come along?"

"I'll say I would, but I can't," Seaton replied instantly. "This isn't me at all, you know. But let's see——"

"Oh, of course," Radnor apologized. "In working with you so long and so cordially I forgot for the moment that you are not here in person."

"Nope, can't be done." Seaton frowned, still immersed in the hitherto unstudied problem of the reprojection of a projected image. "Need over two hundred thousand relays and—um—synchronization—neuro-muscular — not on this outfit. Wonder if it can be done at all? Have to look into it sometime—but excuse me, Radnor, I was thinking and got lost. Ready to go? I'll watch you on the plate here and be ready to offer advice—not that you'll need it. Shoot!"

Radnor snapped on the power and he and his aid shot their projections into one of the opposing fortresses, Siblin and his associate going into the other. Through compartment after compartment of the immense structures the as yet invisible projections went, searching for the power rooms. They were not hard to find, extending as they did nearly the full length of the stupendous structures; vaulted caverns filled with linked pairs of mastodonic fabrications, the liberator-converters.

Springing in graceful arcs from heavily insulated posts in the ends of one machine of each pair were five great bus-bars, which Radnor and Siblin recognized instantly as secondary leads from the converters—the gigantic mechanisms which, taking the raw intra-atomic energy from the liberators, converted it into a form in which it could be controlled and utilized.

Neither Radnor nor Siblin had ever heard of five-phase energy of any kind, but those secondaries were unmistakable. Therefore all four images drove against the fivefold bars their perfectly conducting fields of force. Four converters shrieked wildly, trying to wrench themselves from their foundations; insulation smoked and burst wildly into yellow flame; the stubs of the bars grew white-hot and began to fuse; and in a matter of seconds a full half of each prodigious machine subsided to the floor, a semimolten, utterly useless mass.

Similarly went the next two in each fortress, and the next—then Radnor's two projections were cut off sharply as the Chloran's impenetrable zone of force went on, and that fortress, all its beams and forces inoperative, floated off into space.

Siblin and his partner were more fortunate. When the amœbus commanding their prey threw in his zone switch nothing happened. Its source of power had already been destroyed, and the two Valeronian images went steadily down the line of converters, in spite of everything the ragingly frantic monstrosities could do to hinder their progress.

The terrible beam of destruction held steadily upon that fortress by the beamers in Valeron's mighty dome had never slackened its herculean efforts to pierce the Chloran screens. Now, as more and more of the converters of that floating citadel were burned out those screens began to radiate higher and higher into the ultra-violet. Soon they went down, exposing defenseless metal to the blasting, annihilating fury of the beam, to which any conceivable substance is but little more resistant than so much vacuum.

There was one gigantic, exploding

flash, whose unbearable brilliance darkened even the incandescent radiance of the failing screen, and Valeron's mighty beam bored on, unimpeded. And where that mastodonic creation had floated an instant before there were only a few curling wisps of vapor.

"Nice job of clean-up, boys—fine!" Seaton clapped a friendly hand upon Radnor's shoulder. "Anybody can handle them now. Better you take a week off and catch up on sleep. I could do with a little shut-eye myself, and you've been on the job a lot longer than I have."

"But hold on—don't go yet!" Radnor exclaimed in consternation. "Why, our whole race owes its very existence to you—wait at least until our Bardyle can have a word with you!"

"That isn't necessary, Radnor. Thanks just the same, but I don't go in for that sort of thing, any more than you would. Besides, we'll be here in the flesh in a few days and I'll talk to him then. So long!" and the projection disappeared.

IN DUE TIME *Skylark Two* came lightly to a landing in a parkway near the council hall, to be examined curiously by an excited group of Valeronians who wondered audibly that such a tiny space ship should have borne their salvation. The four Terrestrials, sure of their welcome, stepped out and were greeted by Siblin, Radnor, and the Bardyle.

"I must apologize, sir, for my cavalier treatment of you at our previous meeting." Seaton's first words to the coördinator were in sincere apology. "I trust that you will pardon it, realizing that something of the kind was necessary in order to establish communication."

"Speak not of it, Richard Seaton. I suffered only a temporary inconvenience, a small thing indeed compared to the experience of encountering a mind of such stupendous power as yours. Neither words nor deeds can express to you the profound gratitude of our entire race for what you have done for Valeron.

"I am informed that you personally do not care for extravagant praise, but please believe me to be voicing the single thought of a world's people when I say that no words coined by brain of man could be just, to say nothing of being extravagant, when applied to you. I do not suppose that we can do anything, however slight, for you in return, in token that these are not entirely empty words?"

"You certainly can, sir," Seaton made surprising answer. "We are so completely lost in space that without a great deal of material and of mechanical aid we shall never be able to return to, nor even to locate in space, our native Galaxy, to say nothing of our native planet."

A concerted gasp of astonishment was his reply, then he was assured in no uncertain terms that the resources of Valeron were at his disposal.

A certain amount of public attention had of course to be endured; but Seaton and Crane, pleading a press of work upon their new projectors, buried themselves in Radnor's laboratory, leaving it to their wives to bear the brunt of Valeronian adulation.

"How do you like being a heroine, Dot?" Seaton asked one evening, as the two women returned from an unusually demonstrative reception in another city.

"We just revel in it, since we didn't do any of the real work—it's just too perfectly gorgeous for words," Dorothy replied shamelessly. "Especially Peggy." She eyed Margaret mischievously and winked furtively at Seaton. "Why, you ought to see her—she could just simply roll that stuff up on a fork and eat it, as though it were that much soft fudge!"

Since the scientific and mechanical

details of the construction of a fifth-order projector have been given in full elsewhere there is no need to repeat them here. Seaton built his neutronium lens in the core of the near-by white dwarf star, precisely as Rovol had done it from distant Norlamin. He brought it to Valeron and around it there began to come into being a duplicate of the immense projector which the Terrestrials had been obliged to leave behind them when they abandoned gigantic *Skylark Three* to plunge through the fourth dimension in tiny *Two*.

"Maybe it's none of my business, Radnor," Seaton turned to the Valeronian curiously during a lull in their work, "but how come you're still simply shooting away those Chloran vessels by making them put out their zones of force? Why didn't you hop over there on your projector and blow their whole planet over into the next Solar System? I would have done that long ago if it had been me, I think."

"We did visit Chlora once, with something like that in mind, but our attempt failed lamentably," Radnor admitted sheepishly. "You remember that peculiar special sense, that mental force that Siblin tried to describe to you? Well, it was altogether too strong for us. My father, possessing one of the strongest minds of Valeron, was in the chair, but they mastered him so completely that we had to recall the projection by cutting off the power to prevent them from taking from his mind by force the methods of transmission which you taught us and which we were then using."

"Hmm! So that's it, huh?" Seaton was greatly interested. "Maybe I'll take one on the chin, but I'm going to lock horns with that bunch of squidges myself, one of these days. When this projector gets itself done I'll skip over there and try them a whirl—with this fifth-order outfit I think maybe I'll be able to make big medicine on them."

TRUE to his word, Seaton's first use of the new mechanism was to assume the offensive. He first sought out and destroyed the Chloran structure then in space—now an easy task, since zones of force, while impenetrable to any ether-borne phenomena, offer no resistance whatever to forces of the fifth order, propagated as they are in that inner medium, the sub-ether. Then, with the Quedrins standing by, to cut off the power in case he should be overpowered, he invaded the sanctum sanctorum of all Chlora—the private office of the Supreme Great One himself—and stared unabashed and unaffected into the enormous "eye" of the monstrous ruler of the planet.

There ensued a battle royal. Had mental forces been visible, it would have been a spectacular meeting indeed! Larger and larger grew the "eye" until it was transmitting all the terrific power generated by that frightful, visibly palpitating brain. But Seaton was not of Valeron, nor was he handicapped by the limitations of a fourth-order projector. He was now being projected upon a full beam of the fifth, by a mechanism able to do full justice to his stupendously composite brain.

The part of that brain he was now employing was largely the contribution of Drasnik, the First of Psychology of ancient Norlamin; and from it he was hurling along that beam the irresistible sum total of mental power accumulated by ten thousand generations of the most profound students of the mind that our Galaxy has ever known.

The creature, realizing that at long last it had met its mental master, must have emitted radiations of distress, for into the room came crowding hordes of the monstrosities, each of whom sought to add his own mind to those already opposing the intruder. In vain—all their power could not turn Seaton's penetrating glare aside, nor could it wrest from that glare's unbreakable grip

the mind of the tortured Great One.

And now, mental waves failing, they resorted to the purely physical. Hand rays of highest power blasted at that figure uselessly; fiercely driven bars, spears, axes, and all other weapons rebounded from it without leaving a mark upon it, rebounded bent, broken, and twisted. For that figure was in no sense matter as we understand the term. It was pure force—force made palpable and coherent by the incomprehensible power of disintegrating matter; force against which any possible application of mechanical power would be precisely as effective as would wafted thistledown against Gibraltar.

Thus the struggle was brief. Paying no attention to anything, mental or physical, that the other monstrosities could bring to bear, Seaton compelled his victim to assume the shape of the heretofore-despised human being. Then, staring straight into that quivering brain through those hate-filled, flaming eyes, he spoke aloud, the better to drive home his thought:

"Learn, so-called Great One, once and for all, that when you attack any race of humanity anywhere, you attack not only that one race, but all the massed humanity of all the planets of all the Galaxies! As you have already observed, I am not of the planet Valeron, nor of this Solar System, nor even of this Galaxy; but I and my fellows have come to the aid of this race of humanity whom you were bold enough to attack.

"I have proved that we are your masters, mentally as well as scientifically and mechanically. Those of you who have been attacking Valeron have been destroyed, ships and crews alike. Those en route there have been destroyed in space. So also shall be destroyed any and all expeditions you may launch beyond the limits of your own foul atmosphere.

"Since even such a repellent civilization as yours must have its place in the great scheme of things, we do not intend to destroy your planet nor such of your people as remain upon it or near it, unless such destruction shall become necessary for the welfare of the human race. While we are considering what we shall do about you, I advise you to heed well this warning!"

XXI.

THE FOUR Terrestrials had discussed at some length the subject of Chlora and her outlandish population.

"It looks as though you were perched upon the horns of a first-class dilemma," Dorothy remarked at last. "If you let them alone there is no telling what harm they will do to these people here, and yet it would be a perfect shame to kill them all—they can't help being what they are. Do you suppose you can figure a way out of it, Dick?"

"Maybe—I've got a kind of a hunch, but it hasn't jelled into a workable idea yet. It's tied in with the sixth-order projection that we'll have to have, anyway, to find our way back home with. Until we get that working I guess we'll just let the amœbuses stew in their own juice."

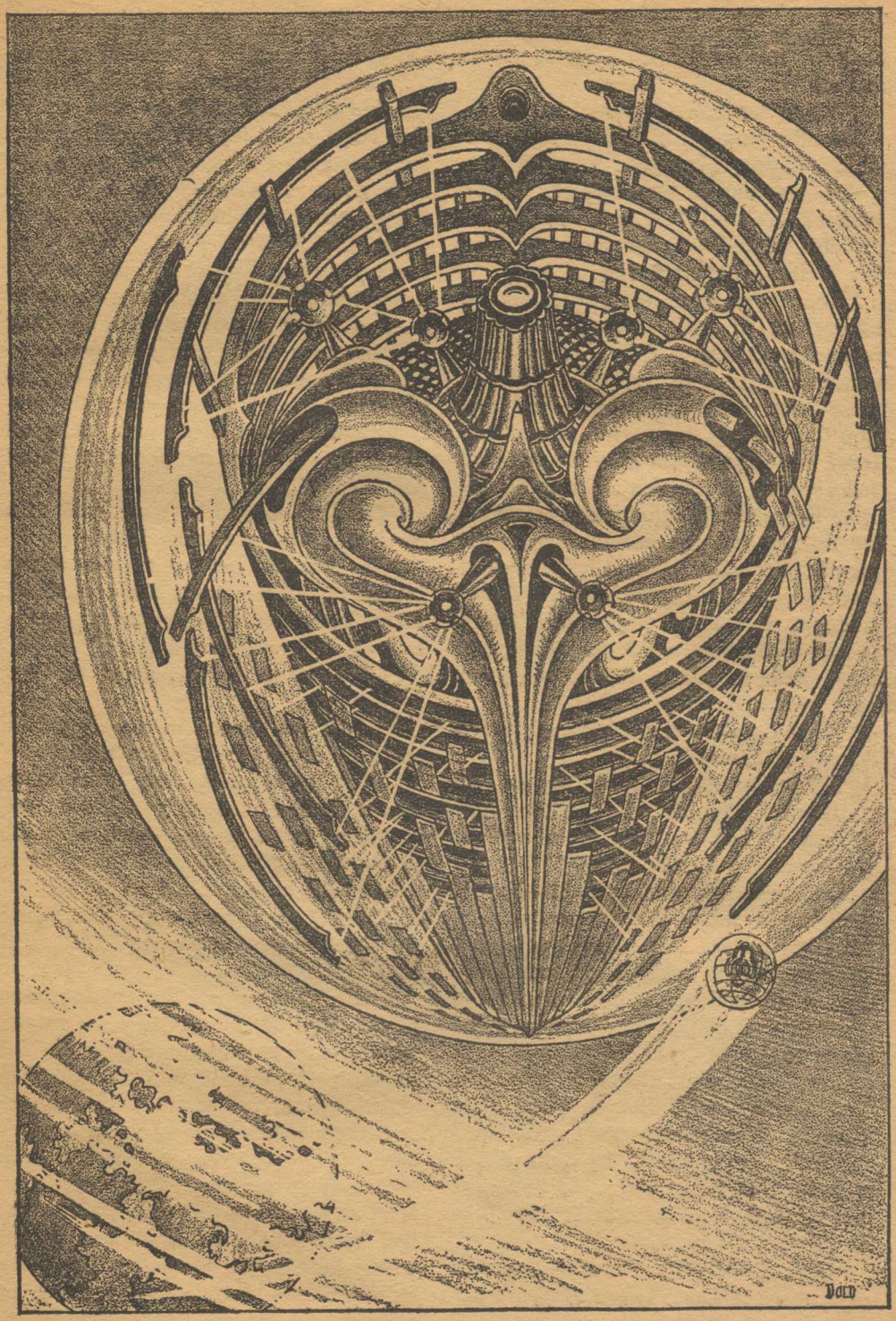
"Well, and then what?" Dorothy prompted.

"I told you it's nebulous yet, with a lot of essential details yet to be filled in——" Seaton paused, then went on, doubtfully: "It's pretty wild—I don't know whether——"

"Now you *must* tell us about it, Dick," Margaret urged.

"I'll say you've got to," Dorothy agreed. "You've had a lot of ideas wild enough to make any sane creature's head spin around in circles before this, but not one of them was so hair raising that you were backward in talking about it. This one must be the prize brain storm of the universe—spill it to us!"

"All right, but remember that it's only half baked and that you asked for it.



As the tiny ship approached, the doors of vast airlocks opened.

I'm doping out a way of sending them back to their own Solar System, planet and all."

"What!" exclaimed Margaret.

Dorothy simply whistled—a long, low whistle highly eloquent of incredulity.

"Maintenance of temperature? Time? Power? Control?" Crane, the imperturbable, picked out unerringly the four key factors of the stupendous feat.

"Your first three objections can be taken care of easily enough," Seaton replied positively. "No loss of temperature is possible through a zone of force—our own discovery. We can stop time with a stasis—we learned that from watching those four-dimensional folks work. The power of cosmic radiation is practically infinite and eternal—we learned how to use that from the pure intellectuals. Control is the sticker, since it calls for computations and calculations at present impossible; but I believe that when we get our mechanical brain done, it will be able to work out even such a problem as that."

"What d'you mean, mechanical brain?" demanded Dorothy.

"The thing that is going to run our sixth-order projector," Seaton explained. "You see, it'll be altogether too big and too complicated to be controlled manually, and thought—human thought, at least—is on one band of the sixth order. Therefore the logical thing to do is to build an artificial brain capable of thinking on *all* bands of the order instead of only one, to handle the whole projector. See?"

"No," declared Dorothy promptly, "but maybe I will, though, when I see it work. What's next on the program?"

"Well, it's going to be quite a job to build that brain and we'd better be getting at it, since without it there'll be no *Skylark Four*——"

"Dick, I object!" Dorothy protested vigorously. "The *Skylark of Space* was a nice name——"

"Sure, you'd think so, since you named her yourself," interrupted Seaton in turn, with his disarming grin.

"Keep still a minute, Dickie, and let me finish. *Skylark Two* was pretty bad, but I stood it; and by gritting my teeth all out of shape I did manage to keep from squawking about *Skylark Three,* but I certainly am not going to stand for *Skylark Four.* Why, just think of giving a name like that to such a wonderful thing as she is going to be—as different as can be from anything that has ever been dreamed of before—just as though she were going to be simply one more of a long series of cup-challenging motor boats or something! Why, it's—it's just too perfectly idiotic for words!"

"But she's *got* to be some kind of a *Skylark,* Dot—you know that."

"Yes, but give her a name that means something—that sounds like something. Name her after this planet, say—*Skylark of Valeron*—how's that?"

"O. K. by me. How about it, Peg? Mart?"

The Cranes agreed to the suggestion with enthusiasm and Seaton went on:

"Well, an onion by any other name would smell as sweet, you know, and it's going to be just as much of a job to build the *Skylark of Valeron* as it would have been to build *Skylark Four.* Therefore, as I have said before and am about to say again, we'd better get at it."

The fifth-order projector was moved to the edge of the city, since nowhere within its limits was there room for the structure to be built, and the two men seated themselves at its twin consoles and their hands flew over its massed banks of keyboards. For a few minutes nothing happened; then on the vast, level plain before them—a plain which had been a lake of fluid lava a few weeks before—there sprang into being an immense foundation-structure of trussed and latticed girder frames of inoson, the hardest, strongest, and

toughest form of matter possible to molecular structure. One square mile of ground it covered and it was strong enough, apparently, to support a world.

WHEN the foundation was finished, Seaton left the framework to Crane, while he devoted himself to filling the interstices and compartments as fast as they were formed. He first built one tiny structure of coils, fields, and lenses of force—one cell of the gigantic mechanical brain which was to be. He then made others, slightly different in tune, and others, and others.

He then set forces to duplicating these cells, forces which automatically increased in number until they were making and setting five hundred thousand cells per second, all that his connecting forces could handle. And everywhere, it seemed, there were projectors, fields of force, receptors and converters of cosmic energy, zones of force, and many various shaped lenses and geometric figures of neutronium incased in sheaths of faidon.

From each cell led tiny insulated wires, so fine as to be almost invisible, to the "nerve centers" and to one of the millions of projectors. From these in turn ran other wires, joining together to form larger and larger strands until finally several hundred enormous cables, each larger than a man's body, reached and merged into an enormous, glittering, hemispherical, mechano-electrical inner brain.

For forty long Valeronian days—more than a thousand of our Earthly hours—the work went on ceaselessly, day and night. Then it ceased of itself and there dangled from the center of the glowing, gleaming hemisphere a something which is only very vaguely described by calling it either a heavily wired helmet or an incredibly complex headset. It was to be placed over Seaton's head, it is true—it *was* a headset, but one raised to the millionth power.

It was the energizer and controller of the inner brain, which was in turn the activating agency of that entire cubic mile of as yet inert substance, that assemblage of thousands of billions of cells, so soon to become the most stupendous force for good ever to be conceived by the mind of man.

When that headset appeared Seaton donned it and sat motionless. For hour after hour he sat there, his eyes closed, his face white and strained, his entire body eloquent of a concentration so intense as to be a veritable trance. At the end of four hours Dorothy came up resolutely, but Crane waved her back.

"This is far and away the most crucial point of the work, Dorothy," he cautioned her gravely. "While I do not think that anything short of physical violence could distract his attention now, it is best not to run any risk of disturbing him. An interruption now would mean that everything would have to be done over again from the beginning."

Something over an hour later Seaton opened his eyes, stretched prodigiously, and got up. He was white and trembling, but tremendously relieved and triumphant.

"Why, Dick, what have you been doing? You look like a ghost!" Dorothy was now an all solicitous wife.

"I've been *thinking,* and if you don't believe that it's hard work you'd better try it some time! 'Sall right, though, I won't have to do it any more—got a machine to do my thinking for me now."

"Oh, is it all done?"

"Nowhere near, but it's far enough along so that it can finish itself. I've just been telling it what to do."

"*Telling* it! Why, you talk as though it were human!"

"Human? It's a lot more than that. It can outthink and outperform even those pure intellectuals—'and that,' as the poet feelingly remarked, 'is going

some'! And if you think that riding in that fifth-order projector was a thrill, wait until you see what this one can do. Think of it"—even the mind that had conceived the thing was awed—"it is an extension of my own brain, using waves that traverse even intergalactic distances practically instantaneously. With it I can see anything I want to look at, anywhere; can hear anything I want to hear. It can build, make, do, or perform anything that my brain can think of."

"That is all true, of course," Crane said slowly, his sober mien dampening Dorothy's ardor instantly, "but still—I can not help wondering——" He gazed at Seaton thoughtfully.

"I know it, Mart, and I'm working up my speed as fast as I possibly can," Seaton answered the unspoken thought, rather than the words. "But let them come—we'll take 'em. I'll have everything on the trips, ready to spring."

"What *are* you two talking about?" Dorothy demanded.

"Mart pointed out to me the regrettable fact that my mental processes are in the same class as the proverbial molasses in January, or as a troop of old and decrepit snails racing across a lawn. I agreed with him, but added that I would have my thoughts all thunk up ahead of time when the pure intellectuals tackle us—which they certainly will."

"Slow!" she exclaimed. "When you planned the whole *Skylark of Valeron* and nobody knows what else, in five hours?"

"Yes, dear, *slow.* Remember when we first met our dear departed friend Eight, back in the original *Skylark?* You saw him materialize exact duplicates of each of our bodies, clear down to the molecular structures of our chemistry, in less than one second, from a cold, standing start. Compared to that job, the one I have just done is elementary. It took me over five hours—he could have done it in nothing flat.

"However, don't let it bother you too much. I'll never be able to equal their speed, since I'll not live enough millions of years to get the required practice, but our being material gave us big advantages in other respects that Mart isn't mentioning because, as usual, he is primarily concerned with our weaknesses—yes? No?"

"Yes; I will concede that being material does yield advantages which may perhaps make up for our slower rate of thinking," Crane at last conceded.

"Hear that? If he admits that much, you know that we're as good as in, right now," Seaton declared. "Well, while our new brain is finishing itself up, we might as well go back to the hall and chase the Chlorans back where they belong—the Brain worked out the equations for me this morning."

FROM the ancient records of Valeron, Radnor and the Bardyle had secured complete observational data of the cataclysm, which had made the task of finding the present whereabouts of the Chlorans' original sun a simple task. The calculations and computations involved in the application of forces of precisely the required quantities to insure the correct final orbit were complex in the extreme; but, as Seaton had foretold, they had presented no insurmountable difficulties to the vast resources of the Brain.

Therefore, everything in readiness, the two Terrestrial scientists surrounded the inimical planet with a zone of force, so that it would lose none of its heat during the long journey; and with a stasis of time, so that its people would not know of anything that was happening to them. They then erected force-control stations around it, adjusted with such delicacy and precision that they would direct the planet into the exact orbit it had formerly occupied

around its parent sun. Then, at the instant of correct velocity and position, the control stations would go out of existence and the forces would disappear.

As the immense ball of dazzlingly opaque mirror which now hid the unwanted world swung away with ever-increasing velocity, the Bardyle, who had watched the proceedings in incredulous wonder, heaved a profound sigh of relaxation.

"What a relief—what a relief!" he exclaimed.

"How long will it take?" asked Dorothy curiously.

"Quite a while—something over four hundred years of our time. But don't let it gnaw on you—they won't know a thing about it. When the forces let go they'll simply go right on, from exactly where they left off, without realizing that any time at all has lapsed—in fact, for them, no time at all shall have lapsed. All of a sudden they will find themselves circling around a different sun, that's all.

"If their old records are clear enough they may be able to recognize it as their original sun and they'll probably do a lot of wondering as to how they got back there. One instant they were in a certain orbit around this sun here, the next instant they will be in another orbit around an entirely different sun! They'll know, of course, that we did it, but they'll have a sweet job figuring out how and what we did—some of it is really deep stuff. Also, they will be a few hundred years off in their time, but since nobody in the world will know it, it won't make any difference."

"How perfectly weird!" Dorothy exclaimed. "Just think of losing a four-hundred-year chunk right out of the middle of your life and not even knowing it!"

"I would rather think of the arrest of development," meditated Crane. "Of the opportunity of comparing the evolution of the planets already there with that of the returned wanderer."

"Yeah, it would be interesting—'sa shame we won't be alive then," Seaton responded, "but in the meantime we've got a lot of work to do for ourselves. Now that we've got this mess straightened out I think we had better tell these folks good-by, get into *Two*, and hop out to where Dot's *Skylark of Valeron* is going to materialize."

The farewell to the people of Valeron was brief, but sincere.

"This is in no sense good-by," Crane concluded. "By the aid of these newly discovered forces of the sixth order there shall soon be worked out a system of communication by means of which all the inhabited planets of the Galaxies shall be linked as closely as are now the cities of any one world."

Skylark Two shot upward and outward, to settle into an orbit well outside that of Valeron. Seaton then sent his projection back to the capital city, fitted over his imaged head the controller of the inner brain, and turned to Crane with a grin.

"That's timing it, old son—she finished herself up less than an hour ago. Better cluster around and watch this, folks, it's going to be good."

AT SEATON'S signal the structure which was to be the nucleus of the new space traveler lifted effortlessly into the air its millions of tons of dead weight and soared, as lightly as little *Two* had done, out into the airless void. Taking up a position a few hundred miles away from the Terrestrial cruiser, it shot out a spherical screen of force to clear the ether of chance bits of débris. Then inside that screen there came into being a structure of gleaming inoson, so vast in size that to the startled onlookers it appeared almost of planetary dimensions.

"Good heavens—it's stupendous!" Dorothy exclaimed. "What did you

boys make it so big for—just to show us you could, or what?"

"Hardly! She's just as small as she can be and still do the work. You see, to find our own Galaxy we will have to project a beam to a distance greater than any heretofore assigned diameter of the universe, and to control it really accurately its working base and the diameter of its hour and declination-circles would each have to be something like four light-years long. Since a ship of that size is of course impracticable, Mart and I did some figuring and decided that with circles one thousand kilometers in diameter we could chart Galaxies accurately enough to find the one we're looking for—if you think of it, you'll realize that there are a lot of hundredth-millimeter marks around the circumference of circles of that size—and that they would probably be big enough to hold a broadcasting projection somewhere near a volume of space as large as that occupied by the Green System. Therefore we built the *Skylark of Valeron* just large enough to contain those thousand-kilometer circles."

As *Skylark Two* approached the looming planetoid the doors of vast airlocks opened. Fifty of those massive gates swung aside before her and closed behind her before she swam free in the cool, sweet air and bright artificial sunlight of the interior. She then floated along above an immense, grassy park toward two well-remembered and beloved buildings.

"Oh, Dick!" Dorothy squealed. "There's our house—and Cranes! It's funny though to see them side by side. Are they the same inside, too—and what's that funny little low building between them?"

"They duplicate the originals exactly, except for some items of equipment which would be useless here. The building between them is the control room, in which are the master headsets of the Brain and its lookouts. The Brain itself is what you would think of as underground—inside the shell of the planetoid."

The small vessel came lightly to a landing and the wanderers disembarked upon the close-clipped, springy turf of a perfect lawn. Dorothy flexed her knees in surprise.

"How come we aren't weightless, Dick?" she demanded. "This gravity isn't—*can't* be—natural. I'll bet you did that, too!"

"Mart and I together did, sure. We learned a lot from the intellectuals and a lot more in hyperspace, but we could neither derive the fundamental equations nor apply what knowledge we already had until we finished this sixth-order outfit. Now, though, we can give you all the gravity you want—or as little—whenever and wherever you want it."

"Oh, marvelous—this is glorious, boys!" Dorothy breathed. "I have always just simply despised weightlessness. Now, with these houses and everything, we can have a perfectly wonderful time!"

"Here's the dining room," Seaton said briskly. "And here's the headset you put on to order dinner or whatever is appropriate to the culinary department. You will observe that the kitchen of this house is purely ornamental—never to be used unless you want to."

"Just a minute, Dick," Dorothy's voice was tensely serious. "I have been really scared ever since you told me about the power of that Brain, and the more you tell me of it the worse scared I get. Think of the awful damage a wild, chance thought would do—and the more an ordinary mortal tries to avoid any thought the surer he is to think it, you know that. Really, I'm not ready for that yet, dear—I'd much rather not go near that headset."

"I know, sweetheart," his arm tightened around her. "But you didn't let me finish. These sets around the house

control forces which are capable of nothing except duties pertaining to the part of the house in which they are. This dining-room outfit, for instance, is exactly the same as the Norlaminian one you used so much, except that it is much simpler.

"Instead of using a lot of keyboards and force-tubes, you simply think into that helmet what you want for dinner and it appears. Think that you want the table cleared and it is cleared—dishes and all simply vanish. Think of anything else you want done around this room and it's done—that's all there is to it.

"To relieve your mind I'll explain some more. Mart and I both realized that that Brain could very easily become the most terrible, the most frightfully destructive thing that the universe has ever seen. Therefore, with two exceptions, every controller on this planetoid is of a strictly limited type. Of the two master controls, which are unlimited and very highly reactive, one responds only to Crane's thoughts, the other only to mine. As soon as we get some loose time we are going to build a couple of auxiliaries, with automatic stops against stray thoughts, to break you girls in on—we know as well as you do, Red-Top, that you haven't had enough practice yet to take an unlimited control."

"I'll say *I* haven't!" she agreed feelingly. "I feel lots better now—I'm sure I can handle the rest of these things very nicely."

"Sure you can. Well, let's call the Cranes and go into the control room," Seaton suggested. "The quicker we get started the quicker we'll get done."

ACCUSTOMED as she was to the banks and tiers of keyboards, switches, dials, meters, and other operating paraphernalia of the control rooms of the previous *Skylark,* Dorothy was taken aback when she passed through the thick, heavily insulated door into that of the *Skylark of Valeron.* For there were four gray walls, a gray ceiling, and a rugged gray floor. There were low, broad double chairs and headsets. There was nothing else.

"This is your seat, Dottie, here beside me, and this is your headset—it's just a visiset, so you can see what is going on, not a controller," he hastened to reassure her. "You have a better illusion of seeing if your eyes are open, that's why everything is neutral in color. But better still for you girls, we'll turn off the lights."

The illumination, which had seemed to pervade the entire room instead of emanating from any definite sources, faded out; but in spite of the fact that the room was in absolute darkness Dorothy saw with a clarity and a depth of vision impossible to any Earthly eyes. She saw at one and the same time, with infinite precision of detail, the houses and their contents; the whole immense sphere of the planetoid, inside and out; Valeron and her sister planets encircling their sun; and the stupendous full sphere of the vaulted heavens.

She knew that her husband was motionless at her side, yet she saw him materialize in the control room of *Skylark Two.* There he seized the cabinet which contained the space chart of the Fenachrone—that library of films portraying all the Galaxies visible to the wonderfully powerful telescopes and projectors of that horrible race.

That cabinet became instantly a manifold scanner, all its reels flashing through as one. Simultaneously there appeared in the air above the machine a three-dimensional model of all the Galaxies there listed. A model upon such a scale that the First Galaxy was but a tiny lenticular pellet, although it was still disproportionately large; upon such a scale that the whole vast sphere of space covered by the hundreds of Fenachrone scrolls was compressed into a volume but little larger than a basket-

ball. And yet each tiny Galactic pellet bore its own peculiarly individual identifying marks.

Then Dorothy felt as though she herself had been hurled out into the unthinkable reaches of space. In a fleeting instant of time she passed through thousands of star clusters, and not only knew the declination, right ascension, and distance of each Galaxy, but saw it duplicated in miniature in its exact place in an immense, three-dimensional model in the hollow interior of the space-flyer in which she actually was.

The mapping went on. To human brains and hands the task would have been one of countless years. Now, however, it was to prove only a matter of hours, for this was no human brain. Not only was it reactive and effective at distances to be expressed in light-years or parsecs: because of the immeasurable sixth-order velocity of its carrier wave it was equally effective at distances of thousands upon thousands of light—millionia—reaches of space so incomprehensibly vast that the rays of visible light emitted at the birth of a sun so far away would reach the point of observation only after that sun had lived through its entire cycle of life and had disappeared.

"Well, that's about enough of that for you, for a while," Seaton remarked in a matter-of-fact voice. "A little of that stuff goes a long ways at first—you have to get used to it."

"I'll say you do! Why—I—it——" Dorothy paused, even her ready tongue at a loss for words.

"You can't describe it in words—don't try," Seaton advised. "Let's go outdoors and watch the model grow."

To the awe, if not to the amazement of the observers, the model had already begun to assume a lenticular pattern. Galaxies, then, really *were* arranged in general as were the stars composing them; there really *were* universes, and they really *were* lenticular—the vague speculations of the hardiest and most exploratory cosmic thinkers were being confirmed.

For hour after hour the model continued to grow and Seaton's face began to take on a look of grave concern. At last, however, when the chart was three fourths done or more, a deep-toned bell clanged out the signal for which he had been waiting—the news that there was now being plotted a configuration of Galaxies identical with that portrayed by the space chart of the Fenachrone.

"Gosh!" Seaton sighed hugely. "I was beginning to be afraid that we had escaped clear out of our own universe, and that would have been bad—very, very bad, believe me! The rest of the mapping can wait—let's go!"

Followed by the others he dashed into the control room, threw on his helmet, and hurled a projection into the now easily recognizable First Galaxy. He found the Green System without difficulty, but he could not hold it. So far away it was that even the highest amplification and the greatest power of which the gigantic sixth-order installation was capable could not keep the viewpoint from leaping erratically, in fantastic bounds of hundreds of millions of miles, all through and around its objective.

But Seaton had half expected this development and was prepared for it. He had already sent out a broadcasting projection; and now, upon a band of frequencies wide enough to affect every receiving instrument in use throughout the Green System and using power sufficient to overwhelm any transmitter, however strong, that might be in operation, he sent out in a mighty voice his urgent message to the scientists of Norlamin.

To be concluded.

ENERGY

by Harl Vincent

Illustrated by M. Marchioni

SPRAWLED through countless passages and oversized rooms in the ninety-seventh and ninety-eighth levels, the Metropolitan Museum of twenty-third-century New York occupied much valuable housing space in the city center just north of the one hundred and tenth crosstown way.

At one time and another, various syndicates and political bosses had conspired to wrest from its trustees full or part title to the space, but always without

success. Ancient and honorable tradition persisted, preserving the museum's curious relics of bygone days, regardless of the fact that the premises were very little frequented by the lackadaisical and pleasure-seeking citizenry of the time.

Confrères of Arnold Dale would have been certain to mark him as somewhat eccentric had they known he was a regular visitor in these dingy rooms and corridors. Not that their opinion or ridicule would have mattered to Dale; his failure to tell them of his visits was occasioned only by his natural habit of keeping his own counsel.

Occupied now with the most serious problem confronting the eleven cities of United North America, he was prowling among the ancient specimen cases of the museum for inspiration. An unusual procedure, perhaps, but Dale was an unusual fellow. The foremost scientist of his generation, he yet refused to accept any theory of his fellow savants or predecessors unless it was susceptible of positive demonstration in the laboratory. But he would adopt as basic and important fact the most antiquated of proved laws, however trivial they seemed. In addition, he was easily the hardest working of the nation's thinkers, seldom leaving his labors until long after the allotted three-hour day had passed.

Tall and spare, habitually stooped, and with an almost totally bald crown, he was anything but a prepossessing figure. His clothes fitted him loosely, seeming several sizes too large.

Pausing now in his quest before a glass case which had often drawn his attention, he peered through the dusty panes at an antique model of the Bohr atom. He studied the three-hundred-year-old relic in silence, pondering on the representations of nuclear components and electronic orbits as if he had never seen them before.

His next stop was in a remote corner of the museum where a number of technical books of the same period were preserved. He observed a volume he had not before noticed, a twentieth-century dictionary, its pages yellowed and cracked, but still partly legible. Under its glass inclosure, the book was open at the caption: "Endecagon, engineer."

Dale read aloud from the pages, with bated breath: "En'e-my, en"er-ge'sis, en"er-gu'men. . . .*En'er-gy*. . . .1. The power by which anything acts effectively to move or change other things or—readiness for effective action. Energy is work and every other thing which can arise from work or be converted into work——"

Not much to quicken the imagination, this archaic definition, yet it served to arouse Dale to sudden activity. He hurried from the museum and made for the lift which would carry him to the topmost level of the city, his thoughts racing with his steps.

Energy! He had worked with it ever since his university days. Energy, synonymous with the power furnished to the eleven cities by the huge generators of the government-controlled power syndicate. Electrical energy, most important of the essenial commodities, the power which throbbed in the motors of the stratosphere planes, provided light, heat, and conditioned air in the vast, continuous city edifices, and actuated the mechanical brains and steel sinews of the robots that in turn produced all things necessary for the welfare and sustenance of the human population. Energy, that essential which was becoming increasingly difficult to supply in sufficient quantity on account of the rapid depletion of natural-fuel resources.

That had been the problem—to find a means of overcoming the alarming shortage of power. And now, after years of fruitless search, Dale was near

to the solution. Now—well, he'd put it up to Carson; he had arrived at his office.

THE PRESIDENT of the power syndicate, a figurehead whose position had been obtained by political maneuvering, sat at his desk asleep. His pudgy hands, crossed over his mountainous paunch, rose and fell in precise rhythm with the strange sounds which issued from between his loosely parted lips.

"Carson!" Dale called sharply.

The executive blinked himself awake and straightened his unwieldly form in the overstuffed cushions of his office chair, putting on an owlish expression of dignity.

"Hm-m! Er—ah—oh, hello, Dale! Must have dozed off. What can I do for you?"

"It's what I can do for you I came about—what can be done for all of United North America."

Carson's beady eyes glittered with real interest. "You've found a new fuel, a new source?"

"Not fuel; I'm planning to harness subatomic energy."

"Dale, you're crazy. They gave that up more than two centuries ago. Disrupting atoms——"

"I know," Dale interrupted impatiently. "No experimenter has been able to utilize nuclear energy efficiently by the destructive method, because the energy obtained is so little in excess of that required in the disruption of the atom. Besides, such a process requires the continual expenditure of energy to produce energy, whereas my building-up process will be progressive of itself, once started. You see, I'm not speaking of the destruction of atoms; I plan to create them."

"Create them!" Carson's lower lip became quiveringly pendulous.

"Yes; I mean to build up atoms of helium from atoms of hydrogen in the same manner as this is accomplished in the sun's interior."

"Impossible! The temperature cannot be duplicated on earth."

"I believe it can, and the necessary pressure as well. Listen, Carson, you don't appreciate the enormity of the possibilities. Why, man, get this—the nucleus of an atom of helium is an endothermic compound emitting one point seventy-five multiplied by the eleventh power of ten gram-calories of energy per gram when it is formed from four protons and two electrons. The energy per atom is four point six multiplied by the minus fifth power of ten ergs, this being almost three times the kinetic energy of the swift alpha particle of range eight point six centimeters of air, from thorium C prime. That lets out the possibility of forming helium atoms by bombardment."

Carson coughed violently to hide his embarrassment. "So——"

"So I come to the necessity of duplicating conditions existing in the sun."

"Hm-m, yes." Carson nodded with forced vigor—to keep himself awake, Dale conjectured. "Seems to me I recall a theory that a small rate of formation of helium from hydrogen may be responsible for the maintenance of the sun's heat."

"Exactly! And do you recollect the figures on the amount of energy available in such a process?"

"Uh, no."

"It is inconceivably great. By calculation, the equivalent of one million horse power for an hour would be liberated if we could build up only four grams—about one seventh of an ounce—of helium from hydrogen. Think of it!"

Carson blinked and fidgeted. "Er—ah—what do you want of me?"

Definitely Dale abandoned hope of conveying understanding to the so-called king of the kilowatts. "Merely the use of the furnaces in the thirty-seventh

metallurgical section," he replied wearily.

"Oh!" Carson sighed his relief—the effort to think seriously had exhausted him—and scribbled something on a card, sliding the pasteboard across his desk. "That'll pass you in and permit of anything you want to do down there. See Miss—ah—oh, yes, Miss Haines. She's the robot supervisor and knows about the furnaces. But, Dale, those furnaces are good for only about eight thousand degrees Fahrenheit, you know."

"I've a way of stepping up the temperature." Dale rose to leave. "Thanks for the pass."

There was no answer. Already the kilowatt king's multiple chin had gravitated chestward.

A SPINSTER in her early thirties, Dorothea Haines was an atavism; she was so unlike the young women of her generation as to have lived almost the life of a recluse. She was of the thinker class and took her responsibilities as seriously as did ever a female department-store manager of the long-forgotten twentieth century.

Her disposition had been soured by much disapproving, if long-range, observation of the looseness and aimlessness of modern life in the eleven cities, and by a firm and growing conviction that the genus homo, as typified by the peoples of United North America, had lost not only its physical vigor but mental capability and ambition as well. Life had become too easy.

She sniffed contemptuously at the prescribed three-hour workday of the thinkers, the only class which toiled to any marked extent at all in this age of the robots. And if only to show her disrespect of the lawmakers, she, like Dale, whom she knew only by repute, often kept to her own tasks for two or three times the legal period.

Miss Haines was not a beauty by any standard of ancient or modern times. She was flat-chested, narrow of shoulder and hip, although, it must be said, with a certain grace of movement. Her complexion was sallow, her face pinched, and exhibited high cheek bones. Thick lenses enormously enlarged her eyes when she stared directly at any one addressing her, invariably causing the addresser to retire in confusion or to forget what was to have been said.

Her personality and appearance made not the slightest difference to the thirty-seventh-level robots she supervised. Automatic machines, all of them, and many bearing no resemblance whatever to mankind, these were creatures of steel and glass and intricate whirring parts, especially designed and constructed to perform the amazingly complex tasks of this vast laboratory in New York's vitals.

Stationed at her central control board or stalking through the long aisles of the laboratory with microphone clamped to her meager bosom, Miss Haines was queen of all she surveyed.

She knew metallurgy, and she knew robots. She thought she knew men and women, but she did not. She did not even know herself, as subsequent events were to prove.

DROPPING seventy levels in the speedy lift, then whisking several miles downtown through the pneumatic tube, Dale was thinking only in the most technical terms of certain phases of the problem he had to work out.

The human aspect of conditions throughout the nation did not enter his mind; he was concerned only with the need of the machines of the eleven cities for energy and more energy. He must and would produce electrical energy in ever-increasing rather than diminishing amount, and at lower cost; it was no affair of his if the mechanizing of the cities and the developing of labor-saving devices were making of mankind a lazy swarm of weaklings.

He shot out across the huge pit which, down through the years, had retained the historical name of Cooper Square. The lounging groups of congenitally feeble-minded, and now stagnating because unoccupied, inhabitants of the sublevels below him, went unnoticed. Dale did note, peering through the transparent wall of the pneumatic tube, that the normal sunglo illumination of the Square had been reduced to about one half its usual brilliance on account of the power shortage.

Impatient to be at work, he stumbled from the car as soon as it halted on the far side of the Square and hustled into the great laboratory of the research-bureau metallurgical section. He was greeted by a prim little female of most forbidding aspect.

"Miss—uh——" Dale began, having forgotten the name Carson had mentioned to him.

"Haines," the spectacled robot supervisor supplied crisply. "Who are you and what do you want here?"

Amused, Dale returned the stare of the accusing eyes. It did not occur to him until later, but those eyes of Miss Haines were not blue but violet—deep violet, with little warning flecks of red in them. His gaze held hers.

It was the first time a man had not quailed under her professional glare. Miss Haines experienced a momentary shiver of apprehension. This man was not human; he was without feeling, like one of her robots.

"Ye-es," he drawled. "Miss Haines; Carson told me. I'm Arnold Dale." The pasteboard changed hands.

"Oh, I see!" Miss Haines glanced at the pass.

"I need one of your furnaces for an experiment. Probably will want a little assistance as well."

"Very well," with a tightening of the lips. "This way, please; I'll let you have as many robot aids as you need—technics."

Dale sensed the woman's antagonism, but immediately forgot it. There was work to do here, and the tools with which to do it. He fell into a brown study before one of the induction furnaces.

Here was a machine that would serve his purpose well, with a few additions and modifications. The huge surrounding coils would have to be reinsulated for higher voltage, and the high-frequency generator speeded up and reconnected for a greatly increased frequency.

The actual heating chamber was not, of course, in evidence, but Dale knew that the touch of a switch would set up the inclosing sphere of force waves which, though invisible, formed an infusible compartment capable of withstanding enormous internal pressures as well as temperatures. This furnace was a most modern one, developed during the past decade for temperatures beyond the melting point of any known material.

"This will do nicely, Miss Haines," he approved, scratching the lobe of his left ear ruminatively. "I should like to——"

Turning, he saw at his side not Miss Haines but one of her technics, a humanlike robot with staring television lenses for eyes and a black disk pick-up microphone below the amplifier mouth. Dale grunted, seeing that the little robot supervisor had made her disappearance. Then, shrugging a shoulder, he issued his orders in the conventional monotone employed for the instruction of the mechanical servants.

AFTER THAT, Dale gave no further thought to the unfriendly woman who was supervisor of the great laboratory. That he had a streak of humor somewhere beneath the coldly scientific exterior is evidenced by the fact that he promptly christened his first robot assistant "Friday," remembering vaguely an ancient voice-vision recording surreptitiously enjoyed in his boyhood.

In truth, he had no immediate need of Miss Haines' assistance or advice. Friday responded promptly and efficiently to every order, acting as foreman of a group of lesser mechanicals drafted for the work of remodeling the furnace to suit his needs. Dale had but to calculate the mathematics of the alterations, which were more extensive than he had at first thought, and dictate his instructions to Friday, who in turn marshaled his forces and directed the detail work on the apparatus.

The mechanicals, some of them huge machines on wheels and comprising a myriad of delicately balanced relays, motors, manipulating arms, and sensitive tentaclelike appendages, dismantled coil windings, prepared new insulating material, and rewound them in accordance with the computed values. Others tinkered with the governor of the frequency generator, replaced the step-up transformers already in the circuit with others of greater ratio, or toiled at the brazing of copper cables and bus bars.

Dale worked almost unceasingly with his emotionless mechanical assistants, talking occasionally to Friday as he would to a human aid. Twenty hours at a stretch, with four hours of sleep there on the premises, then he would resume the grind and repeat the schedule. Only at long intervals did he send Friday for synthetic food pellets and water. At length the furnace was ready for its trial.

"Friday," he croaked gleefully, "we're finished with this part of the job. Get me a tank of hydrogen."

Relays clicked in rapid succession, there was a whir, and Friday replied stridently: "Yes, master."

"Wait!" Dale's irritated tone betrayed his weariness.

Again relays clicked, and Friday halted his clanking stride. "Yes, master."

"Dammit!" exploded Dale. "I'm sick of hearing your 'yes, master.' Where's that fool woman who was around here when I came? I'm itching for the sound of a human voice."

Friday's television lenses regarded him unblinkingly, but the robot made no reply. In that adding-machine brain of his was no place for the sequence of relays that would have permitted him to answer a question like Dale's.

"Oh, go ahead!" grunted the scientist. "Get the hydrogen."

"Yes, master." Friday lumbered off into the gloom of the laboratory. It was an off-work period.

Had Dale listened carefully, he might have heard a half-smothered giggle from out of the shadows.

AN HOUR later, accompanied by the throb of heavily overloaded generators, a pin point of superbrilliance took form within the dazzling confines of the sphere of force, a blinding microscopic magnificence such as had never been viewed by man from close at hand. It heralded the birth of a single atom of helium under conditions such as those existing in the sun itself, pressure and temperature conditions created by the genius of Arnold Dale.

Clothed in heavy asbestos and peering through the dark eyepiece of a welder's helmet, the scientist watched it with breathless interest. He had not observed the small figure, attired in garments like his own, which was crouched at his side. Dorothea Haines had been unable to curb her woman's curiosity.

"What is it?" she demanded, unable longer to hold her peace.

Startled, Dale wheeled upon the ghostlike figure. "Oh, it's you!" he exclaimed. Then, raising his voice above the throb of machinery, he shouted: "Raw energy. At least I *think* it's raw energy, produced by creating helium from hydrogen. Watch this."

He increased the rate of hydrogen feed to the sphere of force and immediately the tiny center of radiation

swelled to the size of a pea, emitting a roar which drowned out the sound of the great generators and set the very structure of the city vibrating about them. Miss Haines recoiled a step, then held her ground.

Dale shut off the power, and the roar subsided. But the energy center maintained its solar brilliance, lighting the surroundings of the laboratory with an intensity many times greater than a magnesium flare. The ball of energy continued to take on mass until he stopped the flow of hydrogen to the force sphere, when it remained suspended in the exact center of the inclosing field, in apparent defiance of the law of graviation.

"It *is* raw energy!" breathed Dale. "Weightless. Pure energy, the basis of all matter."

Miss Haines sniffed, a bit nervously. "Raw energy, maybe. But what's it good for?"

Dale bridled. "Good for? Why—why, woman, don't you realize what this means?"

"It means you've succeeded with a pretty laboratory experiment, as far as I can see."

"Why, dammit, Miss Haines—you ——" Then, unaccountably, Dale laughed. "I'm sorry, truly I am. Suppose we screen off the radiation of the thing and talk it over. I'll appreciate your opinions."

"Very well."

Not much encouragement in the words or tone, but at least Miss Haines did not stage another disappearing act.

Dale built up the frequency of the supplementary generator until he was able to superimpose on the force field a heterodyning wave of the proper beat frequency to neutralize exactly the light radiations from the energy center. Instantly it became invisible, although the feeling of pulsation it had communicated to the air surrounding them persisted, giving proof that it was still there.

They removed their helmets and bulky clothing, then stared soberly at each other.

"We had better go to your office," suggested Dale. "I am not sure of the effect some of these radiations may have on the human body."

Nodding perfunctorily, Miss Haines led the way.

"YOU SEE," Dale told her later, "we are dealing with a thing none of us knows anything about. The structure of the atom has long been known, and it has been proved that its constituent protons and electrons and other so-called particles are merely charges of energy. Exactly what that energy is has never been determined; it has never before been isolated in its raw state.

"Now I have isolated it, I can calculate its potentialities, but I do not yet know how to convert these enormous forces into useful work. That is the job ahead—to segregate the various radiations and develop methods of confining them and utilizing them for the good of mankind."

He had touched a sore spot.

Miss Haines said coldly: "For the *good* of mankind, you say. I presume by that you mean to generate more electrical energy in order that our already-enervated population will be provided with still more leisure time. For the *ruination* of mankind, you had better say."

Dale stared. This woman with whom he had to deal was certainly a queer one. He would be forced to humor her; after all, he did need her assistance and advice.

"Perhaps," he conceded. "But, in any event, a certain amount of electrical energy must be produced to keep things as they are. And that cannot be continued for long with our fuel running as low as it is. This new process of mine opens the way to save the situation."

"Suppose there was no more power —then what?" Miss Haines was obdurate.

Dale eyed the thin line of her mouth reflectively. He would chance a further argument.

"Life in the cities would be impossible. There'd be no light, no air to breathe, no water, no robot servants or workmen, and consequently no synthetic food—nothing. Transportation would cease, not only in the pneumatic tubes and lifts of the cities, but in the stratosphere lanes between them. The population would be compelled to take to the wilderness, where men and women would die like the wild dogs of the outlands, tearing one another to pieces in the madness that comes of starvation."

"The fittest would survive."

It was Dale's turn to shiver inwardly. Forgetting that this was the first time he had given a thought to the human aspect of the power problem, he was aghast at the unfeelingness of the woman's words. He lost his temper.

"Look here, Miss Haines," he blazed. "I don't intend to sit quarreling with you. I've a job to carry through, and I've the authority to draft you as my assistant. But I'd rather not do that; I prefer to have you work willingly with me. What do you say?"

If Dale expected an explosion, he was disappointed. Seated on a corner of her desk, Miss Haines was tapping the floor with one sensibly shod foot.

"Very well," she said, after a tense moment. "I'll work with you. But only because I'm afraid you might otherwise overlook an opportunity."

Being uncertain how to construe her last remark, Dale let it pass. After that, the strangely assorted pair began to plan the work which was to be done.

A MONTH passed by, and the situation in the eleven cities became acute. There had been a drought, and most of the sources of hydro-electric power were no longer able to broadcast energy. Coal, which of late had arrived at the large central generating stations in lesser and lesser amounts, was now almost entirely shut off from them due to the final exhaustion of the West Virginia and Pennsylvania deposits. The long pipe lines from the oil fields of Texas and Louisiana were operating with lower and lower pressure as the supply petered out.

In New York, as in all of the other cities, a rigorous program of energy conservation was inaugurated. In the public ways and meeting places of the sublevels, the sunglo illumination was reduced to one quarter of its normal value and was shut off entirely for a period of ten hours during each twenty-four. The pneumatic tube and lift service in the sublevels was drastically curtailed.

All newscast and television radio equipment below the thirtieth level was cut out of service. In the intermediate levels, the levels of the mechanicals, manufacturing and synthesizing was cut to the absolute necessities, and even these were reduced in quantity, especially in so far as the needs of the lower levels were concerned.

In the upper levels, where were the dwelling quarters and amusement places of the political and thinker classes, hardly any change in normal life was to be observed. Those in power had no thought of submitting themselves to any hardships.

Commerce between the cities had practically ceased. Stratosphere planes consume enormous amounts of broadcast energy in flight, and the regular service, excepting for the junketing trips of politicians and the pleasure jaunts of influential members of the upper-level élite, were quite definitely a thing of the past.

IT WAS at this stage that Carson had a caller, Gregg Twichell, the vice president of the union. As usual, the king of the kilowatts was nodding in his deeply cushioned office chair. Twichell wakened him none too gently.

"What is being done about this matter of the power shortage?" he demanded. "Get your wits together, man. This isn't any time to be asleep on the job."

Carson blinked away a part of his stupor. "You needn't have shaken my teeth loose," he grumbled. "I remember the time I've seen you with your head on your desk."

"Uh, that's different. There's an emergency now."

"Hm-m, yes, Twichell. Quite right, quite right."

The vice president, a small, dapper man with a continuously quivering waxed mustache, became red-faced from the exertion with which he pounded Carson's desk.

"Quite right!" he squeaked. "Quite right, the man says, and the country's going to the dogs! Carson, I ask you, what's being done?"

"Er—ah—oh, yes, I remember." The kilowatt king managed to get himself erect in his chair. "Y-yes; let's see now; Arnold Dale is working on it; he'll be able to straighten out the mess."

"Uh, what does he report?"

A frown of ineffectual anxiety deepened the creases in Carson's brow. "He hasn't reported," he admitted weakly.

"In how long?" Twichell's mustache vibrated threateningly.

"Er—let me see—it's about a month, I guess."

"Guess! The man guesses while the country is going to the dogs! Where's he working on the problem?"

Carson slumped into an attitude of deep meditation. "Ah—now—oh, yes; he's in the thirty-seventh-level metallurgical section."

It seemed that the veins in Twichell's temples must burst under the pressure of blood which dilated them. "Ye gods! The man only now recalls—after a month. Get him, Carson, get him at once and find out how things are progressing."

Languidly the king of the kilowatts asked for a voice-vision connection through to Arnold Dale. Twichell waited nervously for the lighting of the vision screen, but Carson was not yet fully aroused. At length the scientist's features materialized before them.

"You're getting fat," Carson greeted Dale. "Don't look like yourself."

"Think so?" drawled the scientist.

"Ask him," sputtered Twichell. "Ask him how he's coming."

"I heard you," said Dale. "And to answer the question, I'm coming fine. Be ready to demonstrate a new and inexhaustible source of energy to-day."

"To-day!" Carson was fully aroused now. "We'll be right down there to witness it—Twichell and myself."

Dale shrugged. "Suit yourself. I'll be waiting."

The vision screen went blank.

"Carson!" Twichell leaned forward. "You and I—do you realize what we can do with this thing in our hands? That is, if Dale really has what he says."

"Why—why no." Belying his words, Carson's pig eyes gleamed with understanding. "He has it, all right, if he says so."

"Listen, Carson, control of a thing like this—unlimited energy for the needs of the nation—will enable us to overthrow the present government. We can take it in our hands and hold it as long as we wish. You and I, Carson—and possibly Dale, if he's reasonable."

"Sh-h!" The kilowatt king looked nervously behind him.

Twichell tiptoed to the door and closed it, whereupon the two went into a whispered and more than usually animated discourse.

IN THE thirty-seventh-level laboratory, Dale and Miss Haines were at work in a specially insulated cubicle before an instrument panel which incorporated every known variety of indicating and recording apparatus known to the science of engineering. In a corner of the cubicle, an energy center of eight centimeters' diameter spun within the invisible confines of a force sphere which depended from a triad of enormous spirally wound electrodes. The intense brilliance of the energy center was dimmed to an orange glow by neutralizing vibrations.

Clanking ponderously into the room, Friday rasped mechanically: "Honorable Gregg Twichell and Dudley Carson to see Mr. Dale."

"Bring them in." Dale did not look up from his calculation book.

"Yes, master."

"I'll make myself scarce," said Miss Haines. "They'll talk more freely if you're alone." She rose and hustled away.

Dale went through with his calculation to the final result, giving no heed to the meaning throat-clearings of his visitors when they had entered. Eventually he looked up from his work.

"Mr. Twichell, Mr. Dale," offered Carson.

"Yes; I know," drawled the scientist. "Greetings!"

"Well," sputtered the king of the kilowatts. "Tell us about it."

"Yes, do." Twichell grimaced, his mustache tremulous. "How good is your discovery? Does it solve the power problem?"

For answer, Dale pulled a switch and there was a surge of energy which set every instrument on his panel into oscillation. "Right at the moment," he told them casually, "the energy center you see back there is radiating more than a billion kilowatts of energy per hour. Of this, eighty-five per cent is convertible into electrical energy at transmission voltage by means of the recovery screens and transformers I've developed."

Carson peered at the instruments as if he knew the meaning of their indications. Twichell fluttered about like a mother bird in defense of its young.

"What is it?" he demanded. "How does it work? Can you duplicate it?"

Dale chuckled, unimpressed by the man's empty title. "Too many questions all at once, Twichell. But I'll try to answer them. The suspended ball over there beneath the force sphere electrodes, the ball of what looks like heated metal, is a concentration of raw energy, brought into being by the building up of helium atoms from hydrogen. It radiates two hundred and forty forms of energy, most of them usable and of great value to science.

"I can duplicate the energy center as often as desired, and each replica of the one you see will provide an inexhaustible source of its various energies if supplied at infrequent intervals with minute charges of hydrogen at the proper pressure and temperature. Larger energy centers can be produced if required, a single center sufficiently large for the supplying of power for one of our entire cities being easily built up."

"Why, Dale, it's a miracle!" clucked Twichell. "It's just what we need—what we've been searching for. Isn't it, Carson?"

The kilowatt king nodded as vigorously as the folds of his triple chin would permit. "Ah—it is, indeed; the very thing."

Twichell's fidgetings quieted to an electric tenseness. His voice lowered. "Go ahead, Carson. Tell him."

"You tell him."

"No, you—oh, all right!" Twichell cleared his throat, facing Dale purposefully. "We—Carson and I—have a proposition to put up to you, Dale. A stupendous proposition, a thing made possible by this discovery of yours."

The scientist raised his eyebrows, let-

ting his right hand stray to the lobe of his left ear. "Yes?" he proffered helpfully.

Twichell came to the point: "It's like this. The three of us here, you and Carson and I, are in a position to take national affairs in our own hands. We can form a triumvirate, a dictatorship, and control commerce, industry, government, as we choose, merely by virtue of the absolute monopoly we shall have of the electrical power upon which our modern civilization depends so absolutely. All wealth and power is ours for the taking, all——"

"Stop!" bellowed Dale. He had been listening in open-mouthed astonishment, even though, knowing Carson as he did, he was not entirely unprepared for just such a move as this. "You're talking to the wrong man, Twichell, although there's more truth than poetry in some of your words. The big mistake in your speech is the use of the word 'we'; in that you have erred, and sadly. Now you listen to me, both of you; I've something to get off my chest."

The so-called men of affairs and influence listened.

DALE SPOKE swiftly and incisively: "Something has awakened in me, gentlemen, something I did not know was in my make-up. I have come to take a personal interest in the welfare of our nation and of mankind in general. I like your idea of a dictatorship immensely and shall lose no time in adopting it, but *I* shall be the dictator in United North America, not 'we.'

"Conditions are rotten, as you well know; they'd be worse if you two old vultures acquired any real authority. Twenty-odd years ago there was supposed economic reform in this country; wealth was divided equally among all classes and a new era was promised. But what happened?

"Political grafters and criminally-minded sharpers soon took all of the government vouchers and credits away from those of the sublevels, and poverty was again the lot of the under dog, probably in worse degree than ever before in our history. Nobody starved, on account of the meager doles to the downtrodden masses by those in power, but a miserable condition has existed and still exists in the lower levels.

"Things are still worse in the upper levels, where men and women are living in luxurious uselessness and physical and moral degeneracy. Our people have lost their physical vigor and stamina, because all the tasks they should rightfully perform are done for them by the robots. We are a nation of effeminate and despicable men and scatter-brained women. Something must be done to save us from ourselves.

"And something shall be done. There is to be a dictator, as you so nimbly suggested, Twichell, and that dictator will be Arnold Dale. *I* shall control the power industry; *I* shall so proportion the feeding of energy to the various uses as to benefit rather than harm our unfortunate people. Robot labor will be reduced, human labor gradually increased, political bossism and thievery abolished, a new and equable economic system established."

"You're crazy, Dale," whined Carson. "I—I'll put you in irons; I'll call out the robot police—I'll——"

Dale towered over his two visitors. "You'll do nothing of the kind. *I* have the power; don't forget it. I can neutralize the energy of the power syndicate. In an instant I can shut off the activating power from all the robots; then you are helpless, you and all of your kind. Watch this."

The scientist closed a switch, and the room reverberated to the roar of the energy center with the discontinuance of the inclosing force sphere vibrations. Its dazzling light beat shut their eyelids; its emanations set their blood aboil in their veins. The thing was a seeth-

ing inferno of pure energy, of incalculable destructive force. Carson and Twichell yelped with pain and terror.

"Turn it off!" begged the kilowatt king. "Please, Dale, turn it off! I believe you; I quit."

Grinning, Dale opened the switch, and the energy center was once more confined. Twichell, he saw, had slumped weakly into Carson's arms, and that worthy, his elephantine legs planted widely apart, was just able to support the wizened form of the vice president.

"Friday," the scientist called to his robot aid, "you may show the gentlemen out."

"Yes, master."

MISS HAINES came out from her hiding place behind the instrument panel. Her cheeks were aglow with excitement, and something more. For the first time, Dale observed that she was no longer wearing the thick-lensed spectacles.

"You heard it all, then?" he asked her.

"I did. Mean it, Arnold?"

"You bet I mean it."

Miss Haines sighed blissfully. "You were wonderful; it's too good to be true."

"Nonsense! Let's get back to work."

But Miss Haines was in no working mood. She tugged at Dale's arm, forcing him to look at her. "Arnold Dale," she accused him, "you don't even know what's happened—to us."

Dale stared and stammered: "To—to us?"

"That's what I said. Have you seen your reflection in a mirror lately? Have you given *me* more than a passing glance?"

Dale had done neither, it seemed. He now surveyed his coworker carefully, his gaze starting at the floor and not resting until it came to the piquant face under the mass of glorious hair. Miss Haines was a new woman, filled out and rejuvenated, with alluring curves, rounded cheeks, and red lips, now tremulously parted. Those violet eyes, now softly agleam with warm light, were like no eyes Dale had ever seen.

"Dorothea!" he gasped. "You—you're beautiful!"

"It's the energy center," she gurgled. "Radiation one thirty-nine—the one I've been experimenting with by myself. Look what it's done for us—for you." She prodded his arm. "That's not fat, it's good firm muscle. Carson didn't know what he was talking about when he said you were getting fat. You have been remade physically by the energy; so have I.

"In this new program of yours we can do more for our fellow men even than you planned. We can remake them, give them back the energy and physical fitness they've lost. That's the energy *I* call important; not your old electrical energy."

At last Dale saw the light. He and Dorothea Haines—why, it was a miracle if ever there had been one—they were completely transformed in appearance, in nature. He had told the truth when he said she was beautiful. And his own physical and mental rehabilitation now was evident to himself.

He and Dorothea—the connection repeated itself over and over in his thoughts—they belonged to each other. They'd mate legally, and work together till the end of all things. It was the greatest of the rewards that had come from his labors with the raw-energy process. His being was swept by a new and vehement accession of energy, the energy which fires a man when he desires a mate.

Reaching eager arms for the willing girl, his gaze encountered the staring electric-eye lenses of his first robot assistant.

"Friday," he said softly, "you may leave the room."

"Yes master."

Osa the Killer

Exploring the mind of a mantis!

by Clifton B. Kruse

Illustrated by Elliot Dold

EXCERPTS from a report from Frank Williams, a senior at Harvard University, to his father, Dr. Randolph Williams, of New York City. The following informal story sent by the young man to his father quite interestingly substantiates the detailed and technical Bulletin 80E24 of Western States College for November, 1936.

YOU'LL EXCLAIM that this is an incredible tale, fabricated from the stuff of an entomologist's dreams. But it's true and—you can't argue otherwise—it is evermore life itself. I came out here to this dismally hot and arid little prairie town expecting to swelter away three precious months of my life as a Harvard undergraduate and, would you know it, right from the moment the train pulled out and left me standing at the Havendale Station I sensed adventure?

But let me get my story organized. To begin with, there was no one to meet me at the station. Not a blessed sign of our famous cousin, Peter Bill. By the way, all the folks out in this small Western college town call him Peter Bill as we do, rather than Professor Peter Wilfred Williams.

I was just swinging up the narrow path to the small white cottage—imagine old Peter Bill, the bachelor, with a whole house to himself!—when out from the door, on a dead run, came the lanky legs and bald head of the one and only Peter Bill.

Well, to be brief, Peter Bill was in quite a flurry because he'd completely overlooked the fact that his young cousin Frank Williams of dear old Harvard was due to arrive this day for a summer of visiting, co-study, and a lot of co-fishing, too.

"But I tell you, Frank," he jabbered on in that breathless way he always talks when excited or embarrassed, "I'm working on the greatest thing yet. It's intense, boy. It grips. It——"

After about thirty minutes of this I did get it straight that he'd been doing a lot of very private and unusual work in his field and that it looked as if the climax of a tremendous research was about to be reached.

Anyway, after we had our tea and the usual vegetarian lunch, Peter Bill dragged me into a particularly large room at the rear of his cottage. Although this energetic and amazingly lean professor of entomology called this room his laboratory, you must remember that from one end of the cottage to the other the place is positively creepy with a heterogeneous and multitudinous collection of pickled and mummified entomological specimens—bugs to you. So you can just lie back and have a drunkard's dream of what the old boy's laboratory is like.

Even so, Peter Bill led me, with reverent, caressive gestures, to gaze upon the twelve bell jars upon his main worktable—twelve communities of beautiful praying mantes.

"But why all the tubes and radio sets, Peter Bill?" I asked first thing. "Do we talk to the little green bugs and give them X-rays?"

I had uttered this in genial levity, of course. However, old Peter Bill gave me the oddest look. He started to say something, too, but quickly closed his mouth and smiled queerly to himself. All through the afternoon Peter Bill lectured me on the habits and characteristics of this curiously cruel insect so that I began to feel that something impended in regard to them; something far more than any ordinary laboratory or field observation of the mantes could ever mean.

Yet it was not until the following morning that I discovered how accurate was my premonition.

TO BEGIN with, my job was to stuff live crickets, June bugs, and flies into the jars of mantes. Lovely, long green creatures they were as they would squat motionless, forelegs lifted as if in prayer, and the gauzy, lustrous sheen of their bodies resembling freshly sprouted, leafy greens soon after an April rain.

Then, suddenly, when the unsuspecting little gray cricket approached too near in its wonder and admiration, the

peaceful-looking mantis would let fly those cruel, saw-toothed forelegs, seize and crush the cricket, and slowly munch a gory breakfast while the insect was still alive.

To hear Peter Bill go into ecstasies of mothering content as he carefully checked to see that each of his live-meat-eating beauties had been amply satisfied, one would never so much as dream that he'd been a strict vegetarian himself for years. But that's an entomologist for you.

After Cousin Peter Bill was sure that I had been thoroughly grounded in the fundamentals of mantis life, he began to show and explain a few things about the extraordinary equipment he had gathered here in the laboratory. Unfortunately much of what he said was quite over my head and, too, I'm sorry to admit, I really did not pay a great deal of attention to the technical details. Sufficient for my curiosity were the facts that, by means of controlled light reflections, Peter Bill hoped to penetrate the little world of his precious insects and thus obtain a wealth of fine detail which heretofore had been completely overlooked. Also, I was to sit by and take notes of our discoveries as Peter Bill would suggest.

So it was that twenty-four hours after my arrival at Professor Peter Wilfred Williams' white cottage in Havendale, I was seated before the main laboratory table, paper and pencils beside me—which unfortunately I didn't get to use—and the entire upper half of my head incased in a peculiarly designed helmet of finely meshed copper wires. Peter Bill wore a similar contraption, both of which were wired to the small cabinet beside Peter Bill's chair.

Blinds had been pulled down, and a single light above the laboratory table cast its dull, yellowish rays down upon us. To be candid, I must admit that I found the whole procedure unaccountably solemn. I still did not fully realize what it was that Peter Bill was about to do.

"All set!" Peter Bill sang out triumphantly, grasping a small switch at the same time.

Click! Then a soft humming as the apparatus started. If one was merely listening and not looking on, he would swear that from the sound some one was warming up a rather worn radio set. Nevertheless, the curious green light—which the newspapers now refer to as the "Emerald Ray"—gave ample indication that something quite out of the ordinary was astir.

For some time—possibly a full thirty minutes—nothing occurred. At least there was nothing happening which aroused any response from me; although Peter Bill would give a grunt of satisfaction every now and then. The entire affair was becoming rather monotonous, and the green light so affected me that I had to force myself to keep awake.

"Contact!"

The word thundered through my head, causing me to give a sudden jump. Had Peter Bill yelled in my ear? No; I was sure that he hadn't moved his lips. In fact he hadn't really voiced a sound. It's creepier than you think.

Now things were happening, although I was bewildered and somewhat unsettled in the pit of my stomach. The wire-mesh helmet on my head had become suddenly alive, tingling my scalp and seeming to rise up, despite the fact that there was no observable physical pull. Yet the strange vibration was stirring all through me. I was getting dizzy. At last I had to grab the arms of the chair and forcibly will myself to settle down. The sensation was quite like one's conscious struggle against nervous hysteria.

"Consciousness contact—relax—ready for the shift—relax."

Not Peter Bill's voice. Not even the real sound of words, mind you. But

this was Peter Bill talking to me. I knew this much. All the while I had the sensation of flying up, up, up. That infernal helmet was pulling me high in the air. Not actually, of course, because I still had my eyes open and I could see. The laboratory, Peter Bill bending over the big table, and the hazy green light, were all apparently as they had been. Yet if I closed my eyes I had the sensation of sailing swiftly up and up into the sky.

Click! Something somewhere snapped, and everything became unearthly quiet; hazy, too. I couldn't see now. I blinked my eyes, and a queer blur of milky-white light seemed to flow over and around me like some viscuous fluid. I couldn't cry out or jump up, either. My mind battled frantically. But it was useless. I had absolutely no control over my muscles.

Somewhere a voice called out. It sounded faint, as if coming from a great distance. I tried to call out, too. Then the other voice answered. Without reasoning it out, I was conscious of talking with Peter Bill through the medium of thought transference.

"Relax—follow me—simply relax. Don't try to think. Don't try to move."

I did as Peter Bill commanded. Now the fearful sense of being alone and helpless left me. I felt a strange, incorporeal contact of intelligence. It's quite beyond words to picture to any one the sensation; nevertheless, I felt that I was moving out and away from myself and that Peter Bill was beside me.

THE THICK, fluid light before my eyes seemed to be taking on some definite though kaleidoscopic form. I was peering first at one point and then at another. Slowly understanding—or a telepathic suggestion from Peter Bill—caused me to cease my efforts to visualize this scene in relation to any past experience in sight. Again I relaxed, letting the strange flowing colors in this milky light penetrate my mind.

Now I was seeing—actually seeing. Yet not in the way one sees in everyday life. My mind was receiving light impressions and construing meaning for every color and fluctuation.

I was seeing—from the eyes and with the sensory nerves of one of Peter Bill's precious insects. Part of the explanations which I shall give as I go along were reconstructed after the experience. At this time, remember, I was merely receiving impressions. Occasionally some telepathic suggestion would reach me from Peter Bill's mind. However, much of my understanding of this affair was given me by later discussions with the four scientists whom I shall mention later.

I was looking out over a wilderness of sandy soil, a strange land wherein thick blades of grass towered higher than trees. I was conscious, too, of a personality; crude, rudimentary, and with a small range of emotional thought, to be sure, yet it was at least an entity.

This entity had feeling. She drew in the warm air; felt the rough touch of the coarse sand upon which her long body rested motionlessly. Uppermost in the limited consciousness was the urge of watchfulness and expectancy. Though the massive body did not move, the sharp eyes stared unblinkingly at the close horizon. The primitive lust of the hunter was in this being a supreme motive in life. Gradually, too, I knew that this thing of which I felt inexplicably a part was a complete life the name of which was Osa.

Conjecture, comparison, reason, all such attributes of the human mind were wanting. At the time I, too, fell into the acceptance of the ever-existing present. There was no sense of time, no thinking beyond the crude, essential wants of a physical individual.

Swiftly alert! No movement here, yet the whole massive body tensed.

There, the distance of three lengths of Osa's long body, hovered a strange gray creature. Osa knew hunger, knew the thrill of blood lust. Slowly, almost imperceptibly, the long pulpy body rose upon the stubby legs. Forelegs were tightly pressed to the erect thorax, and the tiny, jet-black face with its innocent-looking pointed snout and great beady eyes swayed ever so slowly, rhythmically.

Now the gauzy wings unfolded. Osa was secure in the knowledge that her person was exquisite to behold. Osa knew, too, that the soft, alluring green of her body, the diaphanous glitter of her great wings, were as a delectable fresh sprout of succulent grass to her approaching prey.

The gray thing moved nearer its wondering little eyes fixed upon the incomparable beauty that was Osa's. It moved nearer, nearer, step by step. Now it was close enough to touch the soft thorax with its curiously symmetrical round spots.

Like lightning, Osa's forelegs shot out. Swifter than sight the saw-toothed edges cut into the gray cricket's body as Osa refolded her forelegs. A perfect tool! The cricket squirmed, struck out its legs in crazed fear. Still Osa pressed, driving the sharp thorns of her forelegs deeper into the cricket's pulpy body.

Osa fed, squatting down to earth again and leisurely sucking in the flesh and fluid which had been the cricket's body. Only the chitinous parts were rejected as Osa fed, wasting not a single edible morsel of her victim.

And through the limited mantis brain of Osa welled an incomplete emotion of contentment.

Time passed without a conscious thought of it in the mind of Osa the mantis. Life was only in the present. Life was little more than hunting. Now and then she would move leisurely from place to place, swaying slowly, instinctively alert. Though the long abdomen was heavy with the flesh and fluid of many victims, still the lust to kill and eat was the constant thought in the faint consciousness of Osa.

THEN a new emotion came to disturb the massive serenity of the mantis. The thing she saw was as beautiful as herself, and even larger. From Osa's pointed little snout were hissed the few sounds she could make. The other creature responded.

There was really no hearing. The movements of the snouts seemed to set up a feeling within the body of the mantis which had an interpretive measure of hearing.

Fiega was an old female, proud and resentful of the younger Osa's presence. Fiega now stood erect, wings outstretched and vicious forelegs sparring suggestively. Osa, too, became erect in battle array. Forelegs gestured, but did not quite clash.

Osa knew fear as the clawlike forelegs of Fiega slashed perilously near. Fiega was only pretending. The needle-sharp prongs came only so close to the soft flesh of Osa's thorax. Yet Fiega had now moved a step nearer. Her body seemed more tense, the vast wingspread more suggestive of the death battle.

Fear clutched at Osa's tiny brain. Her long green body quailed. Then, suddenly, blind with panic, Osa threw all her energy into a mad flight.

A GREAT deal of time must have passed. As I recall the details now, I am sure that the fear-crazed Osa must have unconsciously held us in a mesmeric spell. Indeed, the next clear vision came upon us with a total lack of definite conscious memory. That eternal, endless present! It's a strange feeling. Small wonder that the insects, with all their marvelous perfection of body, have utterly failed to evolve and

dominate as have the physically incompetent beings whose minds, nevertheless, are active in memory and conscious reasoning.

Now Osa was the hunting, feeding mantis again. Fear had passed, so also had the memory of the challenging Fiega.

A new emotion, not fully expressed in Osa's mind, came suddenly to command our attention. Something had happened to cause Osa's body to quiver with a new sense of the satisfaction and right of life.

Osa's tiny head was swaying rhythmically to the slow, measured approach of a creature similar to, yet attractively unlike, Osa herself. Osa saw the smaller body, noted the stronger faster legs of this other. Too, the deeper green of his body was a stimulation to Osa's excited yet not wondering mind.

Ziss, daring little male mantis, hesitated just beyond reach of Osa's forelegs. He expanded his wings so that their glossy sheen might win between two instincts. Ziss was food. Also Ziss aroused some latent stirring within Osa's greater body some peculiar sensation which was quite different from, though just as disturbing as, the pangs of hunger. But Osa had eaten till her fat abdomen was swelled. And the meaningful sway of Ziss' head and wings made the decision easier. Along the narrow thorax, and rippling almost imperceptibly over her abdomen, the quavers of acceptance answered the courtship of Ziss. He approached.

A fluttering moth—one which doubtlessly had escaped being eaten at the morning feeding—suddenly descended. The two mantes were immobile, their green bodies and motionless outspread wings simulating innocent vegetation. Between the two mantes the moth alighted.

Food—the thought energized Osa's brain. Swiftly her forelegs shot out to grasp the moth's soft body.

But Ziss had struck also. Like blades of a mower the forelegs of Osa and Ziss tore into the moth's body, rendering the victim in two.

Osa had instinctively crushed her portion to her mouth. Yet her sharp, beady eyes saw the major piece of the moth tightly fixed in Ziss' folded forelegs. Osa tensed with anger. Her forelegs became taut. Her snout remained above the torn flesh of the moth.

Quickly Osa dropped her portion of the victim and rose to her full height, wings outstretched. Her eyes were fixed in a gaze of bitter hate upon the greedily feasting Ziss. Osa moved toward him, forelegs tensed for the spring, wings stiff with the battle challenge.

But Ziss, sucking in the fresh-killed food, did not look up.

Osa struck out. Forgetful that this was her newly accepted mate, conscious only that this other mantis had robbed her of her rightful prey, Osa sought to kill and to do so with the utmost speed.

Her sharp claws dug into the soft, unprotected thorax of her mate—a deft twist, now a sharp cut straight and down. Osa drew in the squirming body of Ziss, folding him helplessly in the thorny embrace of her forelegs and exposing the abdomen to her greedy snout.

Osa squatted to the ground. Slowly, deliberately, she began the systematic removal of all of Ziss which was soft and edible. Even the bit of moth still fixed in his snout was consumed with satisfaction. Ziss was not a mate. Ziss was not even a thing of life. To Osa, Ziss was now a delectable morsel of food to be leisurely and pleasantly consumed.

Yet the meal was scarcely half eaten when a queer sound aroused Osa. Now she tensed. Slowly, she arose, though still clutching the remains of the unwise Ziss in her legs.

Scarcely a body's length away, radiant in all her splendor of green body and

vast wing-spread stood the angry old female Fiega.

FROM the sharp vibration of the wings as well as by the peculiar tightening of the forelegs Osa sensed the challenge of the other mantis. Fiega resented the feasting of Osa, even as Osa had gone mad at the sight of Ziss with the larger portion of moth.

Osa steadied herself. Now she backed a step, unfolded her own wings. The remains of Ziss fell to her feet as Osa covered her thorax with her forelegs. But Fiega, quick to take advantage of Osa's momentary perplexity, advanced. Osa held her ground, striking out warningly with one foreleg. Fiega halted. Wings fluttered. Fiega jabbed viciously straight toward the top round spot upon Osa's thorax. Yet Osa had fended off the blow.

Osa felt suddenly heavy. Her abdomen was too full for flight now that Fiega was virtually upon her. Forelegs were pressed tighter to thorax. Now one leg would jab forward. But Fiega was too swift. Osa's blows glided off the tough chitinous foreleg of her attacker.

Fiega sensed Osa's trouble. Osa's swollen abdomen swayed awkwardly. Quickly, now, Fiega pressed forward, first one foreleg and then the other cutting in toward Osa's thorax in steady succession. Osa fought back desperately. Not fear, but cold, unemotional determination possessed her. It was to be a fight to the finish.

In Osa's limited mind there could be no room for thoughts of escape; nothing of subterfuge, nor any fearful dwelling upon what might happen should Fiega overcome her. Osa was like a machine. Every muscle, every nerve, every move of her body, was in perfect accord with her will to tear the soft pulpy body of the oncoming Fiega.

Osa threw herself forward in a desperate lunge, stretching one foreleg straight ahead. Fiega lurched back. The tip of Osa's claw scraped the soft thorax. But Fiega had struck up quickly. Now she wrenched downward, caught and crushed Osa's driving foreleg.

Osa stumbled forward. Fiega twisted and struck. Still Osa's foreleg remained fixed in Fiega's desperate grasp. Maddened from the pain and the fearful advantage of the other, Osa let fly the other foreleg which had been protecting her own thorax. It was a win-all or lose-all chance. She had to reach Fiega's thorax. But should she fail there was the grim certainty that Fiega would take full advantage of this momentary uncovering.

Osa strained every fiber of her beautiful body, stretched forward full length in the lightninglike drive. Forelegs clicked against the rough thorns of Fiega's own driving foreleg. Osa grasped—missed.

Fiega had warded off the desperate blow. But now Fiega was quick to take advantage of Osa's awkward position. She cut under Osa's wild blow, dug one long, sharp claw into the soft pulp of Osa's thorax, and ripped up the full length to the tiny, gasping head.

Blackness—a deep, smothering, hideous blackness. It's impossible to relate how heavy and ugly and oppressive that sensation was. For that moment of Osa's death broke our consciousness contact. It was like a quick blow on the head. I was stunned, floundering crazily in some wildly swirling universe of horrible screechy sound.

It was then that my numbed brain began slowly, painfully, to arouse itself from the awful stupor. How long I sat there, dazed and sick, I do not know. Gradually, however, I began to see, to realize where I was and what had occurred. I shook myself reached up, tore off the infernal wire-mesh helmet, and stood up.

There was poor old Peter Bill. He

was still leaning across the laboratory table, his eyes wide with horror. He looked like a dead man, like one who had met with some quick and particularly horrible death. For a moment I really believed that he was dead; that in some way this hellish experiment had snapped the cells in his brain.

I probably went berserk. At any rate I dashed over and began to twist and tear at the controls. I must have jerked and torn at about every loose end before the thing went dead. Then I got to Peter Bill. Frankly, I don't know what I did to bring him to. All I remember is that I worked with crazed desperation.

At last he blinked his eyes, looked around weakly. Then he smiled at me and fell asleep.

IT WAS toward night when I got Peter Bill over to the college hospital. He wasn't really sleeping. Something was wrong. His mind was fixed in an unbreakable trance.

Well, of course, you know the rest. The newspapers were blatant with all sorts of stories on the "Emerald Ray." Of course they played up Professor Peter Wilfred Williams as a mad genius. I'll not recount the few official interviews poor old Peter Bill was able to gasp out during the next four days. Give the officials here at Western States full credit for salvaging what they could of Peter Bill's data. They worked nobly from the few babbled words, the general idea I gave them, and the disorganized scribblings which passed as scientific notes to Peter Bill.

What I want to get down now is the real ending of the story which the papers didn't get. I'm writing this to you in order to get it off my mind. Then I'm going south and west, and don't look for me at home or Harvard, either, before Christmas. But, anyway, here's what I have to tell:

It was on the fifth day after the experiment. Peter Bill had been completely unconscious for over ninety-six hours. Besides the two physicians and the nurses there were four men staying pretty close to the nearly lifeless body which was Peter Bill—Dr. Henniken, the college president, and Dean Griggs from the State University, together with the Federal Institute entomologists, Weir and Dykes. These were the four who succeeded in salvaging the gains which brilliant old Peter Bill had achieved for his precious science. Don't forget to give these four scientists plenty of credit.

The State University dean had rebuilt Peter Bill's apparatus. I had taken it apart rather viciously, it seems. He had a plan. All four were working desperately against time. We all knew that Peter Bill couldn't last out another day.

The physicians agreed that even such an extraordinary measure as that proposed by the State University dean—and substantiated by the scientists—could do not harm. So it was that Dean Griggs set up his duplicate of Peter Bill's apparatus in the basement room of Administration Hall. Dean Griggs had supplied six of the wire-mesh helmets; nevertheless, there were thirteen sitting about the still, scarcely breathing body of the dying man.

I remember that the chief medico in charge of Peter Bill's case had bent over the emaciated body before Dean Griggs' experimental measure was begun. The doctor had shaken his head and remarked that we'd better be getting along speedily.

I was numb. The first horror had never quite left me. And the sight of poor old Peter Bill lying there with his very breath oozing from the bluish lips was slow torture.

But we were putting a lot of crackbrained hope into this wild hunch of the dean's. It was a case of any port in a storm.

CLICK! We were off. Oh, I tell you the infernal hum of the contraption burned into my ears! It permeated my entire body with sickening terror. But I held on. I was determined to see it through. Maybe, after all, there was some sense in what these men were doing. Poor old Peter Bill!

The crazy, maddening green lights—I shut my eyes against them.

"Contact!"

The same word Peter Bill had used. And it had rung through my horrified brain in the same mysterious way. So far the devilish thing was clicking to perfection.

I opened my eyes, stared horribly. Yes; there it was—the same thick, vicious milky light.

But the milky light began to swirl into a central crimson vortex, swirling faster and faster.

And then there was a scream, a blood-chilling, madman's screech of hellish death. My hair stood on end. I must have come to my feet in sheer horror.

Now the room was a bedlam of crazed, shrieking, cursing voices—the cries of horror and terror of many men! Sounds of struggle, groans.

I tore the helmet from my head, staggered back.

There—no one can conceive the full hideousness of it—but there before me, struggling desperately, were the several doctors and professors who had not been under the spell of the wire-mesh helmet. They were pulling, tearing, fighting, at the naked form of Peter Bill.

Peter Bill? Peter Bill's body, yes; but not with the consciousness of the Western States entomologist. This was a raving, utterly depraved blood-thirsty maniac.

His teeth had sunk into the flesh of Dean Griggs' neck. His fingers clawed brutally, digging handfuls of flesh and blood as the thing which had been Peter Bill tore into and ate—yes, ate—the body of the helpless Dean Griggs.

Peter Bill had become Osa. That was my dominant thought. It still is. The mind of Peter Bill had gone out leaving the consciousness of the killer mantis in control of the body of the man. In some strange inexplicable manner the mind of Osa had not perished with her body, but had been projected by the apparatus into the body of Peter Bill.

One mantis eating another is a gory sight; but for one man to eat another is the picture of hell itself.

Somehow the frantically struggling men pulled the mantis-crazed human away. I saw one of them strike with some heavy object. Others were working desperately over the torn and bleeding Dean Griggs. Then some one led me away. I must have been half crazy myself. I couldn't talk. My eyes were blurred. I felt worn, beaten.

Well, let me close this now.

THEY buried Peter Bill yesterday. It was all necessarily secret and solemn. You've read the general news accounts. Nevertheless, don't pay too much attention to their forceful predictions concerning the "Green Ray." At any rate, you know now why I've got to get clear away; why I must rest and relax. My nerves are still shot.

That's what Bulletin 80E24 doesn't tell about the "Green Ray." It will never be used again. What we know about the mantis is a rare bit of information, paid for with the life of the world's most brilliant entomologist.

FLIGHT on TITAN

Incredible creatures—incredible perils—incredible night on one of Saturn's moons!

by Stanley G. Weinbaum

Illustrated by M. Marchioni

THE GALE roared incessantly like all the tormented souls since creation's dawn, driving the two sliding and tumbling into the momentary shelter of a ridge of ice. A cloud of glittering ice needles swept by, rainbow-hued in the brilliant night, and the chill of eighty below zero bit through the sponge rubber of their suits.

The girl placed her visor close against the man's helmet and said steadily: "This is the end, isn't it, Tim? Because I'm glad I came with you, then. I'm glad it's both of us together."

The man groaned despairingly, and the blast tore the sound away. He turned aside, thinking regretfully of the past.

THE YEAR 2142, as most people recall, was a disastrous one in the financial world. It was the year of the collapse of the Planetary Trading Corporation and the year that ushered in the resultant depression.

Most of us remember the hysterical two years of speculation that preceded the crash. These followed the final development of the Hocken Rocket in 2030, the annexation of the arid and useless Moon by Russia, and the discovery by the international expeditions of a dead civilization on Mars and a primitive one on Venus. It was the Venus report that led to the formation of the P. T. C. and the debacle that followed.

No one knows now who was to blame. All the members of those intrepid expeditions have suffered under the cloud; two of them were murdered in Paris only a little more than a year ago, presumably by vengeful investors in Planetary. Gold will do such things to men; they will take mad risks with what they have, pursuing a vision of what they hope to have, and, when the crash comes, turn on any scapegoat that's luckless enough to be handy.

At any rate, regardless of responsibility, the rumor started that gold was as common on Venus as iron on Earth—and then the damage was done. No one stopped to reflect that the planet's density is less than the Earth's, and that gold, or any heavy metal, should be even rare there, if not utterly absent, as on the Moon.

The rumors spread like an epidemic, and stories circulated that the expedition members had returned wealthy. All one had to do, it seemed, was to trade beads and jackknives to the obliging Venusian natives for golden cups, golden axes, golden ornaments.

The shares of the quickly organized Planetary Trading Corporation skyrocketed from a par of fifty to a peak of thirteen hundred. Vast paper fortunes were made; the civilized world went into a frenzy of speculative fervor; prices of everything shot upward in anticipation of a flood of new gold—food, rent, clothing, machinery.

We all remember the outcome. Planetary's first two trading expeditions

"Uzza, uzza, uzza," thrummed the thing in a soothing, slumberous buzz—and strangely, their minds translated the sounds. It was saying, "Sleep, sleep, sleep——"

looked long and arduously for the gold. They found the natives; they found them eager enough for beads and jackknives, but they found them quite destitute of gold. They brought back neat little carvings and a quantity of silver, scientifically valuable records, and a handful of pearllike stones from Venusian seas—but no gold. Nothing to pay dividends to the avid stockholders; nothing to support the rumor-puffed structure of prices, which crashed as quickly as the shares of Planetary, once the truth was out.

The collapse affected investors and noninvestors alike, and among them Timothy Vick and his Canadian wife Diane. The spring of 2142 found them staring at each other in their New York apartment, all but penniless, and in the very depths of despair. Jobs were vanishing, and Tim's training as a salesman of home vision sets was utterly useless in a world where nobody could afford to buy them. So they sat and stared hopelessly, and said very little.

Tim at last broke the gloomy silence. "Di," he said, "what'll we do when it's all gone?"

"Our money? Tim, something will come before then. It has to!"

"But if it doesn't?" At her silence, he continued: "I'm not going to sit and wait. I'm going to do something."

"What, Tim? What is there to do?"

"I know!" His voice dropped. "Di, do you remember that queer gem the government expedition brought back from Titan? The one Mrs. Advent paid half a million dollars for, just so she could wear it to the opera?"

"I remember the story, Tim. I never heard of Titan."

"One of Saturn's moons. United States possession; there's a confirmatory settlement* on it. It's habitable."

"Oh!" she said, puzzled. "But—what about it?"

"Just this: Last year half a dozen traders went up there after more. One of 'em returned to-day with five of the things; I saw it on the news broadcast. He's rich, Di. Those things are almost priceless.

Diane began to see. "Tim!" she said huskily.

"Yes. That's the idea. I'm going to leave you all I can, except what money I must have, and go up there for a year. I've read up on Titan; I know what to take." He paused. "It's coming near Perigee now. There'll be a rocket leaving for Nivia—that's the settlement—in a week."

"Tim!" murmured Diane again. "Titan—oh, I did hear of it! That's—that's the cold one, isn't it?"

"Cold as Dante's hell," replied Tim. He saw her lips form a word of protest and his blue eyes went narrow and stubborn.

She changed her unspoken word. "I'm going with you," she said. Her brown eyes narrowed to meet his.

DIANE had won. That was over now—the long hours of argument, the final submission, the months of insufferably stuffy air aboard the rocket, the laborious struggle to erect the tiny hemispherical metal-walled shack that served as living quarters. The rocket had dropped them, cargo and all, at a point determined after a long conference back on Earth with Simonds, the returned trader.

He had been an agreeable sort, but rather discouraging; his description of the Titanian climate had sounded rather like a word picture of an Eskimo hell. He hadn't exaggerated, either; Tim realized that now and cursed the weak-

*Note. "Confirmatory settlements" were those created under the international law requiring at least one permanent resident in order to confirm a nation's claim to a planet. This applied only to habitable worlds, of course, not to the asteroids, which were—and are—free for anybody to claim—if anybody wants them.

ness that had made him yield to Diane's insistence.

Well, there they were. He was smoking his single permitted daily cigarette, and Diane was reading aloud from a history of the world, taken because it had some thousand pages and would last a long time. Outside was the unbelievable Titanian night with its usual hundred-mile gale screaming against the curved walls, and the glitter of ice mountains showing green under the glare of Saturn with its rings visible edgewise. One always saw them edgewise from the satellite since it revolved in the same plane.

Beyond the Mountains of the Damned —so named by Young, the discoverer— a hundred miles away, lay Nivia, the City of Snow. But they might as well have been on a planet of Van Maanen's star so far as human contacts went; surely no one could survive a cross-country journey here through nights that were generally eighty below zero, or even days that sometimes attained the balmy warmth of just above freezing. No; they were marooned here until the rocket returned next year.

Tim shivered as the grinding roar of a shifting mountain sounded above the scream of the wind. That was common enough here; they were always shifting under the enormous tidal pull of the giant Saturn and the thrust of that incredible wind. But it was disquieting, none the less; it was an ever-present danger to their little dwelling.

"Br-r-r!" He shuddered. "Listen to that!"

Diane looked up. "Not used to it yet, after three months?"

"And never will be!" he returned. "What a place!"

She smiled. "I know what'll cheer you," she said, rising. From a tin box she poured a cascade of fire. "Look, Tim! Six of them. Six flame-orchids!"*

He gazed at the glowing eggs of light. Like the flush of life itself, rainbow rings rolled in a hundred tints beneath their surfaces. Diane passed her hand above them, and they responded to its warmth with a flame of changing colors that swept the entire keyboard of the spectrum, reds merging into blues, violets, greens, and yellows, then orange and scarlet of blood.

"They're beautiful!" Tim whispered, staring fascinated. "No wonder rich women bleed themselves dry for them. Diane, we'll save one out—the prettiest —for you."

She laughed. "There are things I'd rather have, Tim."

A pounding sounded above the windy bellowing. They knew what it meant; Tim rose and peered through the reënforced window into the brilliant night, and, after a moment of blinking, made out the four-foot-long body of a native sprawled before the door, his curved claws hooked into the ice. On Titan, of course, no creature stood erect against those perpetual howling blasts, no creature, that is, save man, a recent arrival from a gentler world.

TIM opened the door, slipping it wider notch by notch on its retaining chain, since muscular power would have been inadequate to hold it. The wind bellowed gleefully in, sweeping the hanging utensils on the walls into a clanging chorus, spinning a loose garment into a mad dance, chilling the air to bitterness.

The native slithered through like a

*Note. "Flame orchids," the name given to the Titanian gems that caused such admiration twenty years ago. It is not known whether they are products of some form of life—as sea shells on Earth—or whether they are merely inorganic crystalline growths. The composition is largely a complex chromium boride, thermo-sensitive; and the colors change strikingly with any slight temperature variation. Even now, when the inferior ones called chromatites are grown on Earth, science still argues the question of whether they are living forms.

walrus, his streamlined body seallike and glistening with its two-inch protective layer of blubbery flesh. As Tim cranked the door shut, the creature raised the filmy underlids from its eyes, and they showed large, luminous, and doglike.

This was a Titanian native, not much more intelligent than a St. Bernard dog, perhaps, but peaceable and inoffensive, beautifully adapted to its forbidding environment, and the highest form of life yet known on Titan.

He reached into the pouch opening on his rubbery back. *"Uh!"* he said, displaying a white ovoid. As the comparatively warm air of the room struck it, the flame-orchid began to glow in exquisite colors.

Diane took it; against her palms the tints changed more quickly, deepened gloriously. It was a small one, no larger than a robin's egg, but perfect except where it had been attached to some frigid rock.

"Oh!" she exclaimed. "What a beauty, Tim!'

He grinned. "That's no way to bargain."

He pulled out the black case that contained their trade goods, opening it to display the little mirrors, knives, beads, matches, and nondescript trinkets.

The coal-black eyes of the native glittered avidly; he glanced from one article to the next in an agony of longing indecision. He touched them with his clawed, three-fingered hands; he cooed huskily. His eyes wandered over the room.

"Huss!" he said abruptly, pointing.

Diane burst into a sudden laugh. He was indicating an old and battered eight-day clock, quite useless to the pair since it lacked the adjustment to permit to keep other than Earth time. The ticking must have attracted him.

"Oh, no!" She chuckled. "It's no good to you. Here!" She indicated a box of trinkets.

"Ugha! Huss!" The native was insistent.

"Here, then!"

She passed him the clock; he held it close to his skin-shielded ears and listened. He cooed.

Impulsively, Diane picked a pocketknife from the box. "Here," she said. "I won't cheat you. Take this, too."

The native gurgled. He pried open the glittering blade with his hooked claws, closed it and slipped it carefully into his back pouch, stuffing the clock after it. The pouch stood out like a miniature hump as he turned and scuttled toward the door.

"Uh!" he said.

Tim let him out, watching through the window as he slipped across the slope, his blunt nose pointed into the wind as he moved sideways.

Tim faced Diane. "Extravagance!" He grinned.

"Oh, a fifty-cent knife for this!" She fondled the gem.

"Fifty cents back home," he reminded her. "Just remember what we paid for freight, and you'll see what I mean. Why, look at Nivia; they mine gold there, pure, virgin gold right out of the rocks, and by the time the cost of shipping it back to Earth is deducted, and the insurance, it barely pays—just barely."

"Gold?"

"Yes. That's simple to understand. You know how little freight a rocket can carry when it has to be fueled and provisioned for a flight from the Earth to Titan, or vice versa. A mere jaunt of seven hundred and eighty million miles and plenty of chance for trouble on the way. I think the insurance on gold is thirty per cent of the value."

"Tim, shall we have to insure these? How shall we ever manage?"

"We won't. We won't insure these because we'll be going with 'em."

"But if they're lost?"

"If they're lost, Diane, insurance

wouldn't help us, because, then, we'll be lost, too."

II.

THREE more months dragged by. Their little hoard of flame-orchids reached fifteen, then eighteen. They realized, of course, that the gems wouldn't command the fabulous price of that first one, but half that price, even a tenth of it, meant wealth, meant leisure and luxury. It was worth the year of sacrifice.

Titan swung endlessly about its primary. Nine-hour days succeeded nine-hour nights of unbelievable ferocity. The eternal wind howled and bit and tore, and the shifting ice mountains heaved and roared under Saturn's tidal drag.

Sometimes, during the day, the pair ventured into the open, fought the boisterous winds, clung precariously to frigid slopes. Once Diane was swept bodily away, saving herself miraculously on the verge of one of the deep and mysterious crevasses that bounded their mountain slope, and thereafter they were very cautious.

Once they dared to penetrate the grove of rubbery and elastic whiplash trees that grew in the shelter of the nearest cliff. The things lashed out at them with resounding strokes, not violent enough to fell them, but stinging sharply even through the inch-thick layer of sponge rubber that insulated their bodies from the cold.

And every seven and a half days the wind died to a strange and oddly silent calm, was still for half an hour or so, and then roared with renewed ferocity from the opposite direction. Thus it marked Titan's revolution.

At almost equal intervals, every eight days, the native appeared with the clock. The creature seemed unable to master the intricate problem of winding it and always presented it mournfully, brightening at once as Diane set it ticking again.

There was one impending event that worried Tim at times. Twice in its thirty-year period Saturn eclipses the Sun, and for four Titanian days, seventy-two hours, Titan is in utter darkness. The giant planet was nearing that point now and would reach it long before the rocket ship, speeding from the Earth at perigee, was due.

Human occupation dated back only six years; no one knew what four days of darkness might do to the little world of Titan. The absolute zero of space? Probably not, because of the dense and xenon-rich atmosphere, but what storms, what titanic upheavals of ice, might accompany that night of eclipse? Glowing Saturn itself supplied a little heat, of course, about a third as much as the distant Sun.

Well, worry was futile. Tim glanced at Diane, mending a rip in the furry face-mask of her outdoor garment, and suggested a stroll. "A stroll in the sunlight," he phrased it sardonically. It was August back on Earth.

Diane agreed. She always agreed, cheerfully and readily. Without her this project would have been utterly unbearable, and he wondered amazedly how Simonds had stood it, how those others scattered around Titan's single little continent were standing it. He sighed, slipped into his thick garment, and opened the door into the roaring hell outside.

That was the time they came near disaster. They crawled, crept, and struggled their way into the lee of an ice hummock, and stood there panting and gasping for a moment's rest. Tim raised his head to peer over the crest and saw through his visor's protecting goggles something unique in his experience on Titan. He frowned at it through the dense refractive air of the planet; it was hard to judge distances when the at-

mosphere made everything quiver like heat waves.

"Look, Di!" he exclaimed. "A bird!"

IT DID look like one, sailing on the wind toward them, wings outspread. It grew larger; it was as large as a pterodactyl, bearing down on them with the force of that hundred-mile wind behind it. Tim could make out a fierce, three-foot beak.

Diane screamed. The thing was headed for them; it was diving now at airplane speed. It was the girl who seized and flung a jagged piece of ice; the thing veered higher, swept like a cloud above them, and was gone. It could not fly upwind.

They looked it up in Young's book at the shack. That intrepid explorer had seen and named the creature; it was a knife-kite, the same sort of beast that had accounted for the death of one of his men. It wasn't a bird; it didn't really fly; it just sailed like a kite before the terrific blasts of Titan, and touched ground only during the weekly calm or when it had succeeded in stabbing some prey.

But life was scarce indeed on the icy little world. Except for the occasional natives, who came and went mysteriously as spirits, and that single knife-kite, and the whiplash trees near the cliff, they saw nothing living. Of course the crystal bubbles of the ice-ants marked the glacial surface of the hills, but these creatures never emerged, but labored incessantly beneath their little domes that grew like mushrooms as they melted within and received fresh deposits of ice crystals without. A lonely world, a wild, bizarre, forbidding, and unearthly little planet.

It never actually snowed on Titan. The chill air could absorb too little water vapor for condensation as snow, but there was a substitute. During the days, when the temperature often passed the melting point, shallow pools formed on the frozen oceans, augmented sometimes by mighty eruptions of frigid brine from below. The ferocious winds swept these pools into a spindrift that froze and went rushing as clouds of icy needles around the planet.

Often during the darkness Diane had watched from the window as one of these clouds loomed glittering in the cold-green Saturn-light, sweeping by with a scream and a slithering of ice crystals on the walls, and seeming to her mind like a tall, sheeted ghost. At such times, despite the atom-generated warmth of the tiny dwelling, she was apt to shiver and draw her garment closer about her, though she was careful that Tim never observed it.

SO TIME passed in the trading shack, slowly and dismally. The weather, of course, was uniformly, unvaryingly terrible, such weather as only Titan, nearly nine hundred million miles from the moderating Sun, can present. The little world, with its orbital period of fifteen days and twenty-three hours, has no perceptible seasons; only the recurrent shifting of the winds from east to west marks its swing about gigantic Saturn.

The season is always winter—fierce, bitter, unimaginable winter, to which the earthly storms of desolate antarctica are as April on the Riviera. And little by little, Saturn edged closer to the Sun, until one day the western streak of its rings knifed a dark gash across the reddish disk. The eclipse was at hand.

That night saw the catastrophe. Tim was dozing on the bunk; Diane was dreaming idly of green fields and warm sunlight. Outside roared a gale more than usually vociferous, and a steady parade of the ice ghosts streamed past the windows. Low and ominous came the roar of shifting glacial mountains; Saturn and the Sun, now nearly in a direct line, heaved at the planet with a re-

doubled tidal pull. And then suddenly came the clang of warning; a bell rang ominously.

Diane knew what it meant. Months before, Tim had driven a row of posts into the ice, extending toward the cliff that sheltered the whiplash grove. He had foreseen the danger; he had rigged up an alarm. The bell meant that the cliff had shifted, had rolled upon the first of the stakes. Danger!

Tim was springing frantically from the bunk. "Dress for outside!" he snapped. "Quickly!"

He seized her heavy sponge-rubber parka and tossed it to her. He dragged on his own, cranked the door open to the pandemonium without, and a fierce and bitter blast swept in, upsetting a chair, spinning loose articles around the room.

"Close the emergency pack!" he yelled above the tumult. "I'll take a look."

Diane suppressed her upsurging fear as he vanished. She strapped the pack tightly, then poured the precious eighteen flame-orchids into a little leather pouch, and suspended this about her throat. She forced calmness upon herself; perhaps the ice cliff had stopped, or perhaps only the wind itself had snapped the warning post. She righted the chair and sat with her visor open despite the knife-sharp blasts from the door.

Tim was coming. She saw his gloved hand as he seized the doorframe, then his fur-masked face, eyes grim behind the nonfrosting goggles.

"Outside!" he yelled, seizing the pack.

She rose and scrambled after him into the howling inferno just as the second bell clanged.

Barely in time! As the tornado sent her sprawling and clutching, she had a sharply etched glimpse of a mighty pinnacle of glittering ice looming high above the shack; there was a rumble and a roar deeper than the winds, and the shack was gone. One iron wall, caught by the gale, swept like a giant bat above her, and she heard it go clanging and clattering along the slope to the east.

Dazed and horribly frightened, she clawed her way after Tim into the shelter of a ridge, watching him while he wrestled the pack that struggled in the blast like something living. She was calm when at last he got it strapped to his shoulders.

"This is the end, isn't it, Tim?" she said, putting her visor close against his helmet. "Because I'm glad I came with you, then. I'm glad it's both of us together."

Tim groaned despairingly, and the blast tore the sound away. He turned suddenly, slipping his arms around her figure.

"I'm sorry, Di," he said huskily.

He wanted to kiss her—an impossibility, of course, in a Titanian night. It would have been a kiss of death; they would have died with lips frozen each to the others. He put away the thought that maybe that might be the pleasanter way, since death was inevitable now, anyway. Better, he decided, to die fighting. He pulled her down into the lee of the ridge and sat thinking.

They couldn't stay here; that was obvious. The rocket wasn't due for three months, and long before then they'd be frozen corpses, rolling away before the hurricane or buried in some crevasse. They couldn't build a habitable shelter without tools, and if they could, their atomic stove was somewhere under the shifting cliff. They couldn't attempt the journey to Nivia, a hundred miles away across the Mountains of the Damned—or could they? That was the only possible alternative.

"Di," Tim said tensely, "we're going to Nivia. Don't be startled. Listen. The wind's just shifted. It's behind us; we have almost eight Earth days before it changes. If we can make it—twelve,

thirteen, miles a day—if we can make it, we'll be safe. If we don't make it before the wind shifts——" He paused. "Well, it's no worse than dying here."

Diane was silent. Tim frowned thoughtfully behind his goggles. It was a possibility. Pack, parka, and all, he weighed less than Earth weight; not as much less as one would think, of course. Titan, although no larger than Mercury, is a dense little world, and, besides, weight depends not only on a planet's density, but also on distance from its center. But the wind might not hinder them so much, since they were traveling with it, not against it. Its terrible thrust, fiercer than even an equal Earth wind because the air contained thirty per cent of the heavy gas xenon, would be dangerous enough, but—— Anyway, they had no choice.

"Come on, Di," Tim said, rising. They had to keep moving now; they could rest later, after sunrise, when the danger of a frozen sleep was less.

ANOTHER terrible thought struck Tim—there would be only three more sunrises. Then for four Titanian days, the little satellite would be in the mighty shadow of Saturn, and during that long eclipse, Heaven alone knew what terrific forces might attack the harassed pair crawling painfully toward Nivia, the City of Snow.

But that had to be faced, too. There was no alternative. Tim lifted Diane to her feet, and they crept cautiously out of the shelter of the ridge, bowing as the cruel wind caught them and bruised them, even through their thick suits, by flying ice fragments.

It was a dark night for Titan; Saturn was on the other side of the little world, along with the Sun it was soon to eclipse, but the stars shone brilliant and twinkling through the shallow, but very dense and refractive, atmosphere. The Earth, which had so often lent a green spark of cheer to the lonely couple, was not among them; from the position of Titan, it was always near the Sun and showed only just before sunrise or just after sunset. Its absence now seemed a desolate omen.

They came to a long, smooth, windswept slope. They made the error of trying to cross it erect, trusting to their cleated shoes for secure footing. It was misjudgment; the wind thrust them suddenly into a run, pressed them faster and faster until it was impossible to stop, and they were staggering through the darkness toward unknown terrain ahead.

Tim flung himself recklessly against Diane; they fell in a heap and went sliding and rolling, to crash at last against a low wall of ice a hundred feet beyond.

They struggled up, and Diane moaned inaudibly from the pain of a bruised knee. They crept cautiously on; they circled a bottomless crevasse from the depths of which came strange roarings and shriekings; they slipped miserably past a glittering cliff that shook and shifted above them. And when at last the vast bulk of Saturn rose over the wild land before them, and the tiny reddish Sun followed like a ruby hung on a pendant, they were near exhaustion.

Tim supported Diane to a crevice facing the Sun. For many minutes they were silent, content to rest, and then he took a bar of chocolate from the pack and they ate, slipping the squares hastily through visors opened for each bite.

But under the combined radiance of Saturn and the Sun, the temperature rose rapidly more than a hundred degrees; when Tim glanced at his wrist thermometer it was already nearly thirty-eight, and pools of water were forming in the wind-sheltered spots. He scooped some up with a rubber cup, and they drank. Water at least was no problem.

Food might be, however, if they lived long enough to consume that in the

pack. Humans couldn't eat Titanian life because of its arsenical metabolism; they had to exist on food laboriously transported from the Earth, or, as did the Nivian settlers, on Titanian creatures from whose substance the arsenic had first been chemically removed. The Nivians ate the ice-ants, the whiplash trees, and occasionally, it was sometimes whispered, the Titanian natives.

Diane had fallen asleep, lying huddled in a pool of icy water that flowed off into the open and then was whirled into sparkling spray by the wind. He shook her gently; they couldn't afford to lose time now, not with the shadow of the eclipse looming ominously so few hours away. But it tore his heart to see her eyes crinkle in a weary smile as she rose; he damned himself again for ever bringing her to this.

So they plodded on, battered and trampled by the fierce and ruthless gale. He had no idea how far they had traveled during the night; from the crest of a high ridge he looked back, but the shifting hills of ice made localities hard to recognize, and he could not be sure that the grim escarpment far behind was actually the cliff that had crushed their shack.

He let Diane rest again from noon until sunset, nearly five hours. She regained much of the strength spent in the struggle of the night, but when the dropping sun set his wrist thermometer tumbling far toward the hundred-below-zero mark, it seemed to her as if she had not rested at all. Yet they survived another night of inferno, and the gray of dawn found them still staggering and stumbling before the incredible ferocity of that eternal wind.

During the morning a native appeared. They recognized him; in his clawed hands was the battered case of the eight-day clock. He sidled up to them, head toward the wind, and held out his short arms to display the mechanism; he whined plaintively and obviously thought himself cheated.

Tim felt an unreasoning hope at the sight of him, but it vanished immediately. The creature simply couldn't understand their predicament; Titan was the only world he knew, and he couldn't conceive of beings not adapted to its fierce environment. So the man stood silently as Diane wound the clock and responded dully to her smile as she returned it.

"This time, old fellow," she said to the native, "it's ticking away our lives. If we're not in Nivia by the time it stops again——" She patted the blunt head; the creature cooed and sidled away.

III.

THEY RESTED and slept again during the afternoon, but it was a weary pair that faced the inferno of night. Diane was nearing exhaustion, not from lack of nourishment, but simply from the incessant battering she had received from the wind, and the terrific struggle that every step required. Tim was stronger, but his body ached, and the cold, striking somehow through the inch-thick parka, had left him with a painfully frostbitten shoulder.

By two hours after sunset, he perceived hopelessly that Diane was not going to survive the night. She was struggling bravely, but she was unequal to the effort. She was weakening; the pitiless wind kept dashing her to her knees, and each time she rose more slowly, leaned more heavily on Tim's supporting arm. All too quickly came the moment he had foreseen with despairing heart, when she did not rise at all.

He crouched beside her; tears misted his goggles as he distinguished her words above the screaming of the blast.

"You go on, Tim," she murmured. She gestured toward the bag on her

throat. "Take the flame-orchids and leave me."

Tim made no answer, but cradled her tired body in his arms, shielding her as best he could from the furious winds. He thought desperately. To remain here was quick death; at least he might carry Diane to some more sheltered spot, where they could sink more slowly into the fatal sleep of cold. To leave her was unthinkable; she knew that, too, but it had been a brave offer to make.

She clung weakly to him as he lifted her; he staggered a dozen steps before the wind toppled him. He tried again, tried a third time, and the last struggle brought him to the lee of a low hillock. He dropped behind it and gathered the girl into his arms to wait for the cold to do its work.

He stared hopelessly ahead. The wild splendor of a Titanian night was before him, with the icy stars glittering on cold and glassy peaks. Just beyond their hillock stretched the smooth surface of a wind-swept glacier, and here and there were the crystalline bubbles of the ice-ants.

The ice-ants! Lucky little creatures! He remembered Young's description of them in the book at the shack. Within those domes it was warm; the temperature was above forty. He stared at them, fragile and yet resisting that colossal wind. He knew why; it was their ovoid shape, the same principle that enables an egg to resist the greatest pressure on its two ends. No one can break an egg by squeezing it endways.

Suddenly he started. A hope! He murmured a word to Diane, lifted her, and staggered out on the mirror-surface of the ice. There! There was a dome large enough—fully six feet across. He circled to the lee side and kicked a hole in the glittering roundness.

Diane crawled weakly through. He followed, crouching beside her in the dusk. Would it work? He gave a long cry of relief as he perceived the scurrying three-inch figures of the ice-ants, saw them patching the dome with crystal fragments.

Steam misted his nonfrosting goggles. He drew Diane against him and then opened his visor. Warm air! It was like balm after the bitter air without; it was musty, perhaps—but warm! He opened Diane's; she was sleeping in exhaustion and never stirred as he uncovered her pale, drawn features.

His eyes grew accustomed to the gloomy starlight that filtered through the dome. He could see the ice-ants, little three-legged ruddy balls that ran about with a galloping motion. They weren't ants at all, of course, nor even insects in the terrestrial sense; Young had named them ants because they lived in antlike colonies.

Tim saw the two holes that pierced the saucerlike floor; through one, he knew, warm air came up from the mysterious hive below, and the other drained away the melting water of the dome. That dome would grow until it burst, but the ants didn't care; they'd sense the bursting point and have a new dome already started above the holes.

For a time he watched them; they paid no attention at all to the intruders, whose rubber suits offered nothing edible. They were semicivilized little creatures; he observed them curiously as they scraped a gray mold from the ice, loaded it on tiny sledges that he recognized as leaves of the whiplash tree, and tugged the load to one of the holes, dumping it in, presumably, to a handling crew below. And after a while he fell asleep, and precious time trickled away.

HOURS later something awakened him to daylight. He sat up; he had been lying with his head pillowed on his arm to keep his face from the water, and he rubbed the half-paralyzed limb ruefully as he stared about. Diane was still sleeping, but her face was more peace-

ful, more rested. He smiled gently down on her, and suddenly a flicker of motion caught his eye and, at the same time, a flash of brilliance.

The first was only an ice-ant scurrying across the rubber of her parka. The flash was—he started violently—it was a flame-orchid rolling sluggishly in the stream of water to the vent, and there went another! The ants had cut and carried away for food the little leather bag, exposed on Diane's breast by the opening of her visor.

He snatched the rolling gem of flame from the trickling water and searched desperately for the others. No use. Of their eighteen precious ovoids, he had retrieved exactly one—the small but perfect one for which they had traded the clock. He gazed in utter despondency at the flaming little egg for which they had risked—and probably lost—everything.

Diane stirred, sat up. She saw at once the consternation in his face. "Tim!" she cried. "What's wrong now?"

He told her. "It's my fault," he concluded grimly. "I opened your suit. I should have foreseen this." He slipped the lone gem into his left gauntlet, where it nestled against his palm.

"It's nothing, Tim," said Diane softly. "What use would all eighteen be to us, or a hundred?? We might as well die with one as with all of them."

He did not answer directly. He said: "Even one will be enough if we get back. Perhaps eighteen would have glutted the market; perhaps we'll get almost as much for one as we would have for all.

That was a lie, of course; other traders would be increasing the supply, but it served to distract her mind.

Tim noticed then that the ice-ants were busy around the two vents at the center; they were building an inner dome. The crystal egg above them, now eight feet through, was about to crack.

He saw it coming, and they closed their visors. There was a jagged streak of light on the west, and suddenly, with a glistening of fragments, the walls collapsed and went spinning away over the icy floor, and the wind howled down upon them, nearly flattening them to the glacier. It began to thrust them over the ice.

They slid and crawled their way to the jagged crags beyond. Diane was strong again; her young body recovered quickly. In a momentary shelter, he noticed something queer about the light and glanced up to see gigantic Saturn almost half obscuring the Sun. He remembered then. This was the last day; for seventy-two hours there would be night.

And night fell far too quickly. Sunset came with the red disk three quarters obscured, and the bitter cold swept out of the west with a horde of ice ghosts, whose sharp needles clogged the filters of their masks and forced them to shake them out time after time.

The temperature had never been higher than forty below all day, and the night air, coming after that cold day, dropped rapidly to a hundred below, and even the warming filters could not prevent that frigid air from burning in their lungs like searing flame.

Tim sought desperately for an ice-ant bubble. Those large enough were rare, and when at last he found one, it was already too large, and the ice-ants didn't trouble to repair the hole he kicked, but set at once to build a new dome. In half an hour the thing collapsed, and they were driven on.

SOMEHOW, they survived the night, and dawn of the fourth day found them staggering all but helpless into the lee of a cliff. They stared hopelessly at that strange, sunless, Saturn-lighted dawn that brought so little warmth.

An hour after the rising of the eclipsed Sun, Tim glanced at his wrist

thermometer to find the temperature risen only to seventy below. They ate some chocolate, but each bite was a burning pain for the moment that their visors were open, and the chocolate itself was numbing cold.

When numbness and drowsiness began to attack his limbs, Tim forced Diane to rise, and they struggled on. Day was no better than night now, except for the cold Saturn light. The wind battered them more fiercely than ever; it was scarcely mid-afternoon, when Diane, with a faintly audible moan, collapsed to her knees and could not rise.

Tim stared frantically about for an ice bubble. At last, far over to the right, he saw a small one, three feet through, perhaps, but big enough for Diane. He could not carry her; he took her shoulders and dragged her painfully to it. She managed to creep wearily in, and he warned her to sleep with her visor closed, lest the ants attack her face. A quarter of a mile downwind he found one for himself.

It was the collapse of the bubble that wakened him. It was night again, a horrible, shrieking, howling, blasting night when the temperature on his thermometer showed a hundred and forty below. Stark fear gripped him. If Diane's shelter had fallen! He fought his way madly against the wind to the spot and shouted in relief. The dome had grown, but still stood; he kicked his way in to find Diane trembling and pallid; she had feared him lost or dead. It was almost dawn before the shelter collapsed.

Strangely, that day was easier. It was bitterly cold, but they had reached the foothills of the Mountains of the Damned, and ice-covered crags offered shelter from the winds. Diane's strength held better; they made the best progress they had yet achieved.

But that meant little now, for there before them, white and glittering and cold, loomed the range of mountains, and Tim despaired when he looked at them. Just beyond, perhaps twenty-five miles away, lay Nivia and safety, but how were they ever to cross those needle peaks

Diane was still on her feet at nightfall. Tim left her standing in the shelter of a bank of ice and set out to find an ant bubble. But this time he failed. He found only a few tiny six-inch domes; there was nothing that offered refuge from a night that promised to be fiercer than any he had seen. He returned at last in despair.

"We'll have to move farther," he told her.

Her grave, weary eyes frightened him.

"No matter," she said quietly. "We'll never cross the Mountains of the Damned, Tim. But I love you."

They moved on. The night dropped quickly to a hundred and forty below, and their limbs turned numb and slow to respond. Ice ghosts whirred past them; cliffs quaked and rumbled. In half an hour they were both nearing exhaustion, and no crystal shelter appeared.

In the lee of a ridge Diane paused, swaying against him. "No use, Tim," she murmured. "I'd rather die here than fight longer. I can't." She let herself sink to the ice, and that action saved their lives.

Tim bent over her, and as he did a black shadow and glistening beak cleaved the air where his head had been. A knife-kite! Its screech of anger drifted faintly back as it whirled away on that hundred-mile wind.

"You see," said the girl, "it's hopeless."

IV.

TIM gazed dully around, and it was then that he saw the funnel. Young had mentioned these curious caves in the ice, and sometimes in the rocks, of the Mountains of the Damned. Open-

ing always north or south, he had thought them the homes of the natives, so placed and shaped to prevent their filling with ice needles. But the traders had learned that the natives have no homes.

"We're going in there!" Tim cried.

He helped Diane to her feet and they crept into the opening. The funnellike passage narrowed, then widened suddenly into a chamber, where steam condensed instantly on their goggles. That meant warmth; they opened their visors, and Tim pulled out his electric torch.

"Look!" gasped Diane. In the curious chamber, walled half by ice and half by the rock of the mountain, lay what was unmistakably a fallen, carved column.

"Good Heaven!" Tim was startled momentarily from his worries. "This iceberg harbored a native culture once! I'd never have given those primitive devils credit for it."

"Perhaps the natives weren't responsible," said the girl. "Perhaps there was once some higher creature on Titan, hundreds of thousands of years ago, when Saturn was hot enough to warm it. Or perhaps there still is."

Her guess was disastrously right. A voice said, *"Uzza, uzza, uzza,"* and they turned to stare at the creature emerging from a hole in the rock wall. A face—no, not a face, but a proboscis like the head end of a giant earthworm, that kept thrusting itself to a point, then contracting to a horrible, red, ringed disk.

At the point was the hollow fang or sucking tooth, and above it on a quivering stalk, the ice-green, hypnotic eye of a Titanian threadworm, the first ever to be faced by man.* They gazed in horrified fascination as the tubular body slid into the chamber, its ropelike form diminishing at the end to the thickness of a hair.

"Uzza, uzza, uzza," it said, and strangely, their minds translated the sounds. The thing was saying "Sleep, sleep, sleep," over and over.

Tim snatched for his revolver—or intended to. The snatch turned into a gentle, almost imperceptible movement, and then died to immobility. He was held utterly helpless under the glare of the worm's eye.

"Uzza, uzza, uzza," thrummed the thing in a soothing, slumberous buzz. *"Uzza, uzza, uzza."* The sound drummed sleepily in his ears. He was sleepy, anyway, worn to exhaustion by the hell without. *"Uzza, uzza, uzza."* Why not sleep?

IT WAS the quick-witted Diane who saved them. Her voice snapped him to wakefulness. "We *are* sleeping," she said. "We're both asleep. This is the way we sleep. Don't you see? We're both fast asleep."

The thing said *"Uzza, uzza,"* and paused as if perplexed.

"I tell you we're sleeping!" insisted Diane.

"Uzza!" buzzed the worm.

It was silent, stretching its terrible face toward Diane. Suddenly Tim's arm snapped in sharp continuation of his interrupted movement, the gun burned cold through his glove, and then spat blue flame.

A shriek answered. The worm, coiled like a spring, shot its bloody face toward the girl. Unthinking, Tim leaped upon it; his legs tangled in its ropy length and he crashed on his hands against the rocky wall. But the worm was fragile; it was dead and in several pieces when he rose.

"Oh!" gasped Diane, her face white.

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*Note: "Titanian threadworm"—Nematoidus Titani, the curious, quasi-intelligent, sinister creature now believed to be the author of the decayed Titanian civilization, since it is always found among the ruins. It is not dangerous to man if he has a moment of warning; otherwise it is horribly so.

"How—how horrible! Let's get away—quickly!" She swayed and sat weakly on the floor.

"It's death outside," said Tim grimly.

He gathered the ropy worm in his hands, stuffed it back into the hole whence it had emerged. Then, very cautiously, he flashed his beam into the opening, peered through. He drew back quickly.

"Ugh!" he said, shuddering.

"What, Tim? What's there?"

"A—a brood of 'em." He raised the broken end of the column in his arms; the shaft fitted the hole. "At least that will fall if another comes," he muttered. "We'll be warned. Di, we've got to rest here a while. Neither of us could last an hour out there."

She smiled wanly. "What's the difference, Tim? I'd rather die in clean cold than by—by those things." But in five minutes she was sleeping.

As soon as she slept, Tim slipped the glove from his left hand and stared gloomily at their lone flame-orchid. He had felt it shatter when he struck the wall, and there it lay, colorless, broken, worthless. They had nothing left now, nothing but life, and probably little more of that.

He cast the pieces to the rock-dusty floor and then seized a fragment of stone and viciously pounded the jewel into dull powder and tiny splinters. It vented his feelings.

Despite his determination, he must have dozed. He woke with a start, glanced fearfully at the plugged hole, and then noticed that dim green light filtered through the ice wall. Dawn. At least, as much dawn as they'd get during the eclipse. They'd have to leave at once, for to-day they must cross the peaks. They *must,* for to-night would see the shifting of the wind, and when that occurred, hope would vanish.

He woke Diane, who sat up so wearily that his eyes felt tears of pity. She made no comment when he suggested leaving, but there was no hope in her obedience. He rose to creep through the funnel, to be there to help her when the wind struck her.

"Tim!" she shrieked. "Tim! What's that?"

He spun around. She was pointing at the floor where he had slept and where now flashed a thousand changing colors like rainbow fire. Flame-orchids! Each splinter he had cracked from the ruined one was now a fiery gem; each tiny grain was sprouting from the rock dust of the floor.

Some were as large as the original, some were tiny flames no bigger than peas, but all glowed perfect and priceless. Fifty of them—a hundred, if one counted the tiny ones.

They gathered them. Tim told her of their origin, and carefully wrapped a few grains of the rock dust in tinfoil from their chocolate.

"Have it analyzed," he explained. "Perhaps we can raise 'em back on Earth."

"If we ever——" began Diane, and then was silent. Let Tim find what pleasure he could in the discovery.

She followed him through the passage into the howling inferno of Titanian eclipse weather.

THAT day gave both of them all the experience of souls condemned to hell. They struggled hour after hour up the ice-coated slopes of the Mountains of the Damned. The air thinned and turned so cold that the hundred and fifty below which was the minimum on Tim's thermometer dial was insufficient, and the needle rested full against the stop.

The wind kept flinging them flat against the slopes, and a dozen times the very mountains heaved beneath them. And this was day; what, he wondered fearfully, would night be like, here among the peaks of the Mountains of the Damned?

Diane drove herself to the limit, and even beyond. This was their last chance; at least they must surmount the crest before the wind shifted. Again and again she fell, but each time she rose and clambered on. And for a time, just before evening, it seemed that they might make it.

A mile from the summit the wind died to that weird, unnatural calm that marked, if you care to call it so, the half-hour Titanian summer season. They burst into a final effort; they rushed up the rugged slope until their blood pounded in their ears. And a thousand feet short of the summit, while they clung helplessly to a steep icy incline, they heard far off the rising whine that meant failure.

Tim paused; effort was useless now. He cast one final glance over the wild magnificence of the Titanian landscape, then leaned close to Diane.

"Good-by, ever valiant," he murmured. "I think you loved me more than I deserved."

Then, with a bellow of triumph, the wind howled down from the peaks, sending them sliding helplessly along the crag into darkness.

It was night when Tim recovered. He was stiff, numb, battered, but living. Diane was close beside him; they had been caught in a cupped hollow full of ice crystals.

He bent over the girl. In that roaring wind he couldn't tell if she lived; at least her body was limp, not yet frozen or set in the rigor of death. He did the only thing possible to him; he clutched her wrist and started clawing his way against that impossible gale, dragging her behind him.

A quarter mile away showed the summit. He ascended a dozen feet; the wind hurled him back. He gained fifty feet; the wind smashed him back into the hollow. Yet, somehow, dazed, all but unconscious, he managed to drag, push, roll Diane's body along with him.

He never knew how long it took, but he made it. While the wind bellowed in colossal anger, somehow, by some miracle of doggedness, he thrust Diane across the ridge of the summit, dragged himself after, and gazed without comprehension on the valley beyond, where glowed the lights of Nivia, the City of Snow.

For a while he could only cling there, then some ghost of reason returned. Diane, loyal, courageous Diane, was here dying, perhaps dead. Doggedly, persistently, he pushed and rolled her down the slope against a wind that sometimes lifted her into mid-air and flung her back against his face. For a long time he remembered nothing at all, and then suddenly he was pounding on a metal door, and it was opening.

TIM couldn't sleep yet. He had to find out about Diane, so he followed the government man back through the sunken passage to the building that served Nivia as hospital. The flame-orchids were checked in, safe; theft was impossible in Nivia, with only fifty inhabitants and no way for the thief to escape.

The doctor was bending over Diane; he had stripped off her parka and was flexing her arms, then her bared legs.

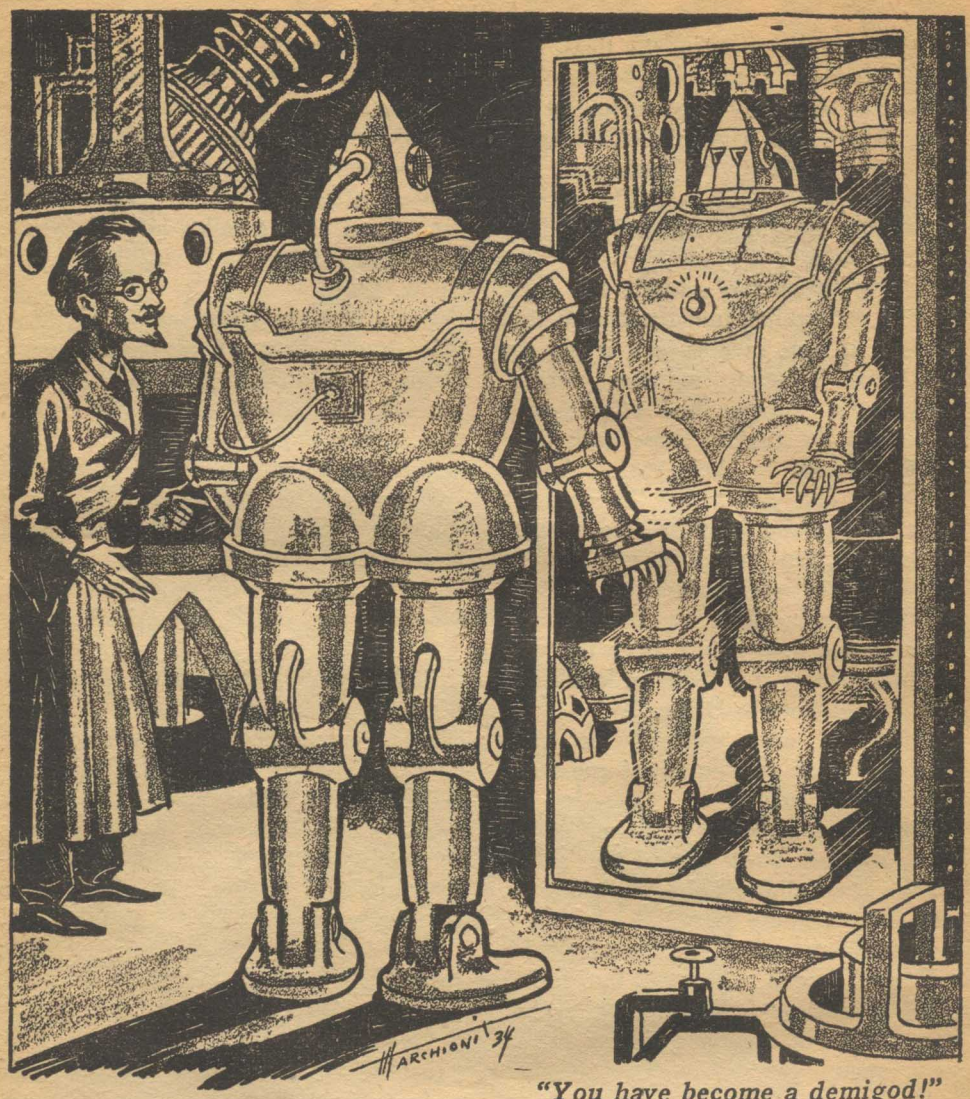
"Nothing broken," he said to Tim. "Just shock, exposure, exhaustion, half a dozen frostbites, and a terrific mauling from the wind. Oh, yes—and a minor concussion. And a hundred bruises, more or less."

"Is that all?" breathed Tim. "Are you sure that's all?"

"Isn't that enough?" snapped the doctor.

"But she'll—live?"

"She'll tell you so herself in half an hour." His tone changed to admiration. "I don't see how you did it! This'll be a legend, I tell you. And I hear you're rich, too," he added enviously. "Well, I've a feeling you deserve it."



"You have become a demigod!"

Mind Over Matter

by Raymond Z. Gallun

Illustrated by M. Marchioni

IF ever I am badly injured, take me to Dr. Toussaint. If ever, after an accident, the company physicians pronounce me dead, take me to Dr. Toussaint anyway."

This was one of Lloyd Jorgensen's favorite sayings spoken half humorously, half ruefully, yet with a deep undercurrent of seriousness and respect.

For you see Llovd Jorgensen was a

crack test flyer for the Hartman Rocket Plane Corporation. He was the biggest, quietest, and probably the nerviest cuss in the outfit, and he knew what his job meant. He knew also Dr. Pierre Toussaint.

Their comradeship was based on mutual admiration, the one for the other. Toussaint admired Jorgensen for his cold, reckless courage and for his almost heroic proportions and physique. As for Jorgensen, the dapper little savant aroused in him a feeling that was close to awe.

Nor was the emotion unfounded. To the test flyer, and in fact to the world at large, Toussaint was not a mere scientist; he was something of a wizard.

And yet a restless, ruthless energy drove him on with the spirit of the conqueror, seeking new fields to bow to his will. His brain, keen and quick as an electric spark, was of the kind with which the world is gifted or cursed, not more, perhaps less, than once in a century.

It was natural in the circumstances that Toussaint should be the ruling personality of the friendship between Jorgensen and himself. Not that he ever wished to dominate his comrade—he was far too human basically for that—but he was assertive and outspoken; he was very sure of what he thought was a proper course to follow.

IT HAPPENED one day when Toussaint came to deliver some blue prints which he had worked out for the Hartman Corporation. Completing his business, he decided to look for Jorgensen. They often played chess or billiards, or just chatted, in the lounge of the pilots' quarters.

He found the massive Scandinavian in his rooms. A moment of scrutiny told him that Jorgensen's feelings were not of the best.

"Either you are unwell, Lloyd, or you are in love," he stated.

The big blond shrugged disconsolately but said nothing.

"Not only in love but—what should I say?—there is a fly in the ointment," the savant added. "May I be so brave as to inquire for details, my little one?"

Jorgensen's grin was sheepish. No use to try to hold anything back from Toussaint.

"Joyce is afraid I'll get killed or maimed for life, Pete," he said. "She won't marry me unless I quit my present job. To make matters brief, that's just what I'm going to do. It will be easy enough to get a position in the offices. I——"

An explosive laugh from Toussaint cut him short. "In an office!" he burst out shrilly, his round blue eyes widening. "You, the strongest of men, in an office, to become, as time passes, a great, fat, sleepy toad—in an office! Bah! It is droll, it is sad, it is disgusting!"

Jorgensen's jaw hardened with anger. "Well," he growled, "I'm free to do as I choose, am I not?"

"But yes, of course, my friend," was Toussaint's quick, placating response. "Only listen. I am older than you; I know. Once I was in love. My woman refused me for the same reason. My work was dangerous. What did I do? I chose my work instead of the woman. Now I am glad—more so than I can tell you."

Toussaint paused for breath. Then he started off again: "You do not believe that experimenting involves physical risk? You do not remember my right hand? Look at it! It seems exactly like my left, only it is artificial. Some years ago I was a bit careless. A beam from a powerful cosmic-ray generator struck it, and *poof*, there was nothing left but lifeless bone. From rubber, from metal, from small electromagnets, from tiny platinum wires, I made another hand, as good, as useful, as if it was of flesh.

"How was it accomplished? Ah, my old one, that is something sane to talk about! It has great possibilities! The electromagnets, the rods attached to them, serve my mechanical hand in place of muscles. A little battery carried over my heart, supplies them with energy. The fine platinum threads penetrate the stump of my arm, and touch the motor nerves which once controlled the movements of my real hand. They collect the minute electric currents produced by the nerve fibers.

"Though not basically electrical, nerve impulses do create small quantities of electricity, proportional to the strength of the impulses. These currents are amplified until they can work the electromagnets. I command my mechanical hand to move, just as if it was a living member, and, behold, the fingers of it, all of it, respond perfectly. See! It can grip almost as good as yours. I will show you."

Toussaint grasped Jorgensen's brown paw and gave it a hearty squeeze. "I apologize for having bored you, my unhappy giant," he said. "But come! You told me that you wished to resign. It is best to put unpleasantness out of the way as soon as possible. Is it not so?" The scientist's smile was faintly uncertain.

"Oh, go to the devil, Pete!"

JORGENSEN didn't resign. There was a deep-hidden sensitiveness within him. A sleepy toad in an office! He could not bear the thought. Besides, he loved flying. He renewed his contract for six months. Perhaps in that times he could win Joyce over.

In his decision, however, fate spoke. Two months afterward, the Grim Reaper made a vicious pass at him. Late one afternoon he climbed blithely into a new plane, X-96, which it was hoped would reach, in the upper stratosphere, a speed in excess of three thousand two hundred miles an hour.

But the ship had barely attained an altitude of three hundred feet when a port-side rocket tube, weakened by some flaw in the metal, exploded, damaging the wing surfaces. Erratically the craft shot groundward. Jorgensen could not get clear. They pulled him from the wreckage, a gory pulp of a man who quivered now and then, and in whom the pulse of life still fluttered feebly.

Fate was pulling the strings again, for Dr. Pierre Toussaint was an eyewitness to the accident. No need to waste precious time calling him. He mastered the situation at once, giving shrill, staccato orders.

In seconds they had the test pilot loaded into an ambulance. In five minutes the twisted flesh of him lay sprawled on a white table in Dr. Toussaint's laboratory. With a gesture the little man sent the others away.

A momentary moisture of rebellion and grief blurred his round eyes. He had not expected this to happen. Subconsicously he must have endowed Jorgensen with some of the immortal qualities of a demigod. But that his hero could revert to dust was starkly evident now.

His gaze grew clear and hard, his lips tightened. With a reckless precision his slender fingers darted here and there. Dr. Pierre Toussaint, wizard, was at work——

LLOYD JORGENSEN battled his way from oblivion, regaining a sluggish and precarious consciousness. Dimly he was cognizant of his surroundings, or, rather, the lack of them. He seemed suspended in a black void, in which great balls of fire burst and spattered every few seconds, bringing with them twinges of exquisite pain, of intense heat, of bitter cold. He seemed to hear grating, roaring sounds.

What was this place? The abode of some post-mortal existence? Heaven,

or, far more likely, hell? His brain was too fogged for him to follow the idea through. But he must have died, or he must have met with an accident. Else, why was that fearful memory spinning inside him—a memory in which he clutched useless controls and hurtled down toward a row of hangars?

Maybe Toussaint was at hand. He tried to call the savant's name, but his vocal chords produced no sound that he could hear. He had no sensation of breathing. He tried to raise himself from wherever he was lying. The only result was a terrific rush of searing agony that almost made him lose his hold on the thin thread of consciousness that he had grasped.

A pretty face—Joyce's—floated across his inner vision. Delirium made him think that it was real. He attempted to clutch at it, as a baby reaches for a bright object. The pain the effort brought drove him back into the emptiness from which he had so recently emerged.

An indefinite time later, the realization of some sort of existence returned. Jorgensen was more comfortable now, his thoughts clearer. However, the things he had noted before—the darkness, the flashes of light, the sounds, and the pain—were still present. After a while, as though a drug had been administered to him, he seemed to fall asleep.

And so it went on, a period of wakefulness followed by a period of slumber, like night and day. It happened so often that he lost count, but he was sure that weeks at least had passed.

His mind could function normally once more. The gloom around him persisted, but the agony was gone except for very rare twinges. The roaring, grating sounds and the flashes of light grew less frequent and seemed confined to definite intervals of time. He knew that he was recovering from the accident, and he was glad. At least he was not dead.

Yet everything was puzzling, filling him with a tense anxiety. Still he could not move or speak; he could not see or hear anything familiar.

AT LAST, when he was almost resigned to an eternity of jumbled, meaningless impressions, a voice spoke to him from somewhere—just a few tired, reassuring words:

"Have patience, my old one. We have a great reason to rejoice. You cannot talk to me yet, but to-morrow, I promise you, we shall chat a little once more. For the present, this must be all. Rest!"

Lloyd Jorgensen did not rest at once. The voice had been Toussaint's without question, and yet there had been something oddly keen about it—metallic, almost. Perhaps it was only because he had not heard coherently for so long. There was no sense in allowing so trivial a matter to become troublesome. He dismissed it and fell asleep.

Toussaint was as good as his word. It was the little savant's voice, sounding queerly elfin with its new, ringing, tinkling tones, that aroused Jorgensen.

"Speak, my small giant!" he commanded gayly. "I long to hear you tell me that you are well. It has been sixty-three days since last we really conversed. Speak, or I shall go mad with suspense!" There was triumph throbbing in his words.

The test pilot felt a curious wave of reverence. "That I am as well as I am is probably nobody's fault but yours, Pete," he said.

That he was actually speaking, he knew, for he could hear what he was saying. His words possessed that same odd, metallic quality that Toussaint's displayed. It annoyed him a trifle.

"Do not waste time on useless flattery. Tell me more!" the savant ordered eagerly.

"No," Jorgensen responded. "I feel all right, and I'm sane. That's enough for just at present. You tell *me* something! Will I be a sound man again? Will I recover my sight and the use of my limbs? For Heaven's sake, spill it!"

The emphasis of Toussaint's answer was almost electrical. It was almost terrifying.

"Yes, my old one, yes! You shall see and hear and feel and move about again. You shall be sounder, more active than ever before."

"Then I'm happy," said Jorgensen. "Do you know what I intend to do? I'm going to quit flying for good. I'm going to marry Joyce. I'm going to get away from machines, at least for a while—away from anything that has wheels to turn around inside it, or is moved by man-harnessed energy. I'm sick of that sort of stuff!"

The scientist's tones became faintly reproachful. "Can you talk thus, Lloyd, when I have made so many plans? Do you still think of the woman when the future holds so much that is glorious and inspiring?"

"What do you mean?" Jorgensen demanded in rebellious puzzlement.

"I cannot say more yet, my stubborn giant." Toussaint chuckled benignantly. "To-morrow you shall know everything. You will be completely recovered then. There is work for me to do. Once more I ask for patience. That is all."

Jorgensen tried to cry out in protest; but his power of speech was suddenly gone, and he could hear nothing with meaning. Again he was imprisoned in a dark void. A sedative stilled his tumultuous thoughts.

TO-MORROW became to-day. Lloyd Jorgensen awoke abruptly. At first everything was just as it had been for over two months. Then there was a snap like the closing of a switch. A great change came. The world materialized around him.

Toussaint was bending over him, haggard and gaunt from overwork, yet smiling. The savant seemed to wait. Then, impatiently, he gestured with his slender hands.

"Up, my lazy colossus!" he piped shrilly. "Is it that you cannot feel your health and your strength? Up! Do not keep me hanging in the air!"

Further invitation was quite unnecessary. Jorgensen was on his feet in the twinkling of an eye. The ease and swiftness of his motion startled him.

Pierre Toussaint rubbed nervous fingers together. That he expected a crisis was evident. He cleared his throat and began to speak in a low, steady manner that was not quite like his usual self.

"It is time to—what should I say?—pull the cat out of the bag, my old one. I can startle you now and explain afterward, or I can explain now and startle you later. Since these are my only two alternatives, I prefer to get the startling over and done with immediately."

He pointed toward a corner of the room. "For the convenience of the occasion I have placed there a large mirror," he went on. "I ask that you examine yourself in it."

Wondering what it was all about, Jorgensen did as he was told. Whereupon he received a double shock. First he did not see himself at all—only what he thought was a reflection of the laboratory equipment. Had he become a disembodied spirit? He brushed his hand dazedly across his forehead. No; he was not a spirit, for the mirror threw back to him the image of a moving hand—his hand—yet it glistened with the silvery sheen of metal.

A thick arm of the same substance supported it, and the arm in its turn was attached to a huge cylindrical torso as smooth and shiny as a new flywheel. There was a second arm and hand on the other side of this body. Two gleaming, jointed pillars, terminating in broad, rubber-shod feet, supported the

monstrous thing's weight, and a head shaped like a pyramid rested on its vast shoulders.

Jorgensen started at the colossal doll, and its great, quartz-lensed eyes stared back. He understood at last. It was the image, the reflection, of himself. By some bizarre alchemy he had become a being of aluminum, steel, glass, and rubber. Deep within him he could feel the throbbing whir of some vital mechanism.

"God!" he choked. "Oh, God!" Though pain-racked, the words were peculiarly without specific feeling. His emotions were stunned.

THE little doctor tapped him solicitously on the shoulder. "You will know presently what I know, my dear pal," he said softly, "for I shall tell you. You are depressed now. You should not be. You have become a demigod. You should rejoice as I am rejoicing, and in the end you shall, I assure you—unless you do something very rash. Glorious things, glorious adventures, lie ahead. I will explain. Do not think; do not interrupt. Only listen!"

The robot nodded dumbly.

"When I brought you here after the plane crashed, in no circumstances could you have lived, as you were, more than half an hour," Toussaint began. "What did I do? What *could* I do? I removed your brain from your skull, salvaging it from the wreckage of your body. I placed it in a bath of oxygenated fluid containing nourishing food elements. I caused the fluid to circulate through the veins and arteries of your brain by means of a small mechanical pump which served you then and serves you now as a heart.

"I kept the fluid always perfectly pure by means of a filter system. The oxygen content was constantly renewed, the carbon dioxide, and other wastes, removed. Necessary gland secretions were supplied in their normal quantities. The temperature was held steady at blood heat. It was all quite simple, entirely automatic.

"Your brain lived, harboring—what should I say?—a trapped soul, an impotent intellect. It could receive no real impressions of the outside world, only false and incoherent sensations of light and sound from the severed and raw optic and auditory nerves, and similarly jangled impressions, including great pain, from other crushed nerve tissue. It had no body. I must give it one, else its life was worse than death.

"You can guess much of the rest. This hand—this mechanical hand of mine—gave me the needed suggestion. I made your form as it is now. I made it strong—far stronger than you were. Thousands of electromagnets went into its construction, almost as many delicate relay systems. As a source of power I installed in it a subatomic energy cell that can hardly run down in a hundred years. Countless fine platinum wires were prepared, ready to be attached to the motor nerves leading out of your brain, when I started the final assembling.

"Meanwhile, I was trying to give you senses. This phase of my task was somewhat more difficult, for I had never worked with sensory nerves before—only motor nerves controlling the movements of muscles. I constructed eyes, they were television cameras, really; I made a microphone to serve you in place of ears; I devised artificial organs of touch, and artificial organs of balance. Smell and taste I did not trouble with, for I considered them superfluous. I fitted my creations with platinum threads for attachment to the various sensory nerve ends leading into your brain. All this was quite simple.

"The great trick, my friend, was to cause those platinum threads to carry a properly modulated electric current to stimulate your nerve cells in just the way that would make you see and hear

and feel properly. Tests were necessary. In part I experimented with you, and when I did, many of those jangled sensations of the first days were doubtless repeated, even though your injuries were healed. But I did not wish to make your position unbearable, so I did most of my testing on a blind man and a deaf mute whom I called in for the purpose.

"Finally I was finished; I was successful. I began putting you, my Hercules, together. When I first spoke to you the work was already far advanced. The next time, we exchanged greetings, your voice nerves activating a sound diaphragm.

"And now, see! You are as you are, my old one. Can you not tell me that you are not too displeased with what has happened?" Toussaint waited, anxiety showing in his pale face and round eyes.

LLOYD JORGENSEN had a better grasp of matters now; he could realize a bit more clearly what his outlandish position might mean to him.

"This is what you called glorious, Pete?" he asked. "I don't quite see it if it is so. Better tell me."

His words seemed mild, composed, and matter-of-fact; yet in them was a hint of a rising fury that might easily swell to murderous proportions.

"Don't see it?" Pierre Toussaint shrilled. "In the name of a green beard, is it not clear? You have become a genie of the Nights Arabian! Your form will never grow tired! You are more powerful than twenty bulls! All of you that is of flesh, your brain, is sealed up, protected from injury, from germ infections, by metal, cushioned by the most efficient shock-absorbing system that I could devise! It is, for all one may know, almost immortal, since it is not dependent upon a weak human body for its sustenance.

"What shall you do with this mechanical form of yours? Continue testing stratospheric planes? Bah, mere play for a child! You shall go on, up, my old one, into space! I have plans—new fuels, better rocket tubes. The terrific acceleration will not trouble you at all. Nor the cold of the void—nothing! You shall walk on the crater bottoms of the Moon, and on the deserts of Mars. Perhaps you shall enter the hot atmosphere of Jupiter, or even plumb the region of the stars. It is colossal! My great child, why can you not understand it as I do?"

Breathless, Toussaint paused. He was sincere, perfectly so, in everything that he had said.

"Where is Joyce?" Jorgensen asked with seeming irrelevance, his words still deadly mild.

Perhaps the voice diaphragm did not register his feelings quite as they were, but his armored shoulders hunched menacingly.

The little doctor looked worried, hurt. "You can understand, Lloyd, that you must put such things behind you," he said. "The woman was properly grief-stricken when she was informed that you were dead. She attended the funeral of your original body. Now she has gone away—I do not know where. By this time she is doubtless herself again. Nature will be kind to her, as it often is to all living creatures. But there is no reason to remember."

The robot that was Jorgensen edged a little closer to Toussaint. "There is no reason?" he queried calmly. "Do you know what you have done to me, Pete? You have stolen my right to be called human, and to enjoy the things human beings were meant to enjoy. You want me to be a pawn in the fulfillment of your dreams.

"Do you remember that day when I was going to quit flying and you laughed? What followed was not your fault, yet I hold you responsible. Per-

haps I'm crazy, but I want revenge. At least you could have let me die. Now I'm going to take these two steel hands you have given me and crush you with them."

Toussaint stared at the advancing metal bulk. Nothing that could be read showed in its gleaming, quartz eyes. The pulse in the scientist's white throat throbbed quickly.

"It is not like that, Lloyd!" he cried. "It cannot be! I did my best, I swear! And I am not infallible! Mistakes—every one makes them!"

Toussaint was not a coward; he was not pleading for his life, but for something more elusive. Understanding, faith, was what he wanted from the cool, silent test pilot who had been his hero for so long.

HOWEVER, the automaton continued its advance. A heavy chair splintered in its path. Its long arms, clawed with steel, reached forward.

Then Pierre Toussaint, wizard, acted. Like a released spring he leaped to close quarters. A dial on the breast of the mechanical man, turned in his grasp. There was a click and the glistening colossus was still. Toussaint opened a small door in its torso and drew a vial from his pocket. Quickly he poured a portion of its contents into the funnel-like end of a tube which led into the vitals of his creation. When this was done he reclosed the door and stood waiting for a full minute.

"Mind over matter," he muttered ruefully. "I am sorry, but it was that or worse."

He returned the dial to its original position. The robot swayed, steadied itself.

"You feel better, Lloyd?" Toussaint queried solicitously.

Jorgensen, who once more had been steeped in familiar gloom, surprised himself by saying "Yes."

He did feel better, much better. A thrilling warmth and a sense of well-being had come over him. Toussaint had been right. Nothing could please him more now than hurtling at terrific speed through the cold emptiness of space—the planets, the stars. This opportunity against the other—how could he have been such a fool?

"In the name of sense, Pete, what did you do to me?" he demanded.

The scientist hung his head just a trifle. "I am not glad, my old one," he said. "I did not wish to tamper with your emotions. It was desecration. But I could not see you unhappy. I put into the nourishing fluid of your brain a certain liquid which—what should I say?—I prepared beforehand for the uncertainties of the occasion. Adrenalin is part of it, and something else.

"Remarkable, is it not, how it changes one's feelings? I must never let you become depressed again. We shall prepare soon for our adventure. Perhaps I shall become as you are, if I can train a surgeon. Perhaps sometimes we shall both return to the flesh if we so desire. Already I know much of why protoplasm lives, you remember. However, it is not fitting for me to say more, my old one. I am very, very tired. I must sleep."

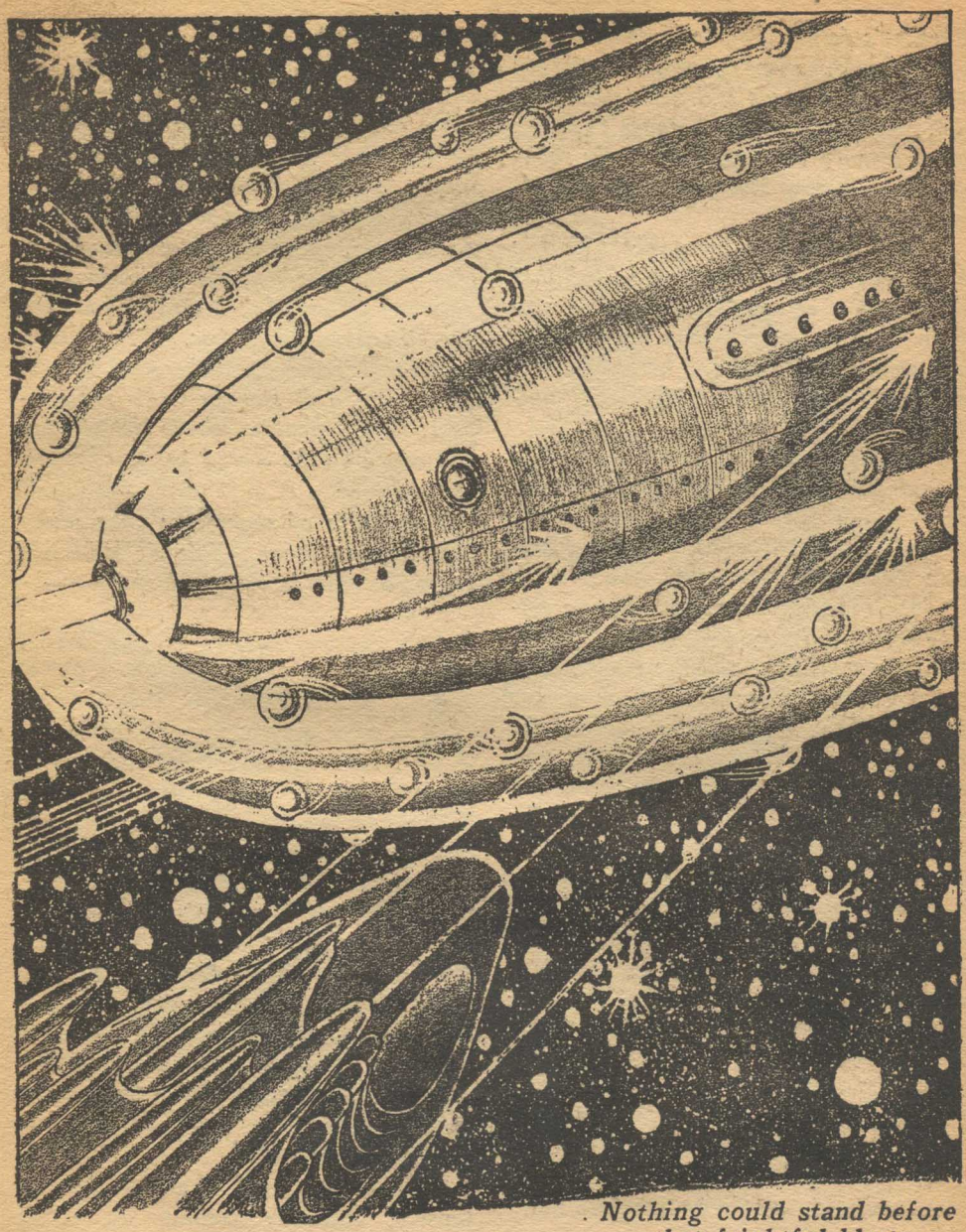
He threw himself down on a near-by couch. Jorgensen watched him benignly until his eyes closed and his features relaxed. If the metal visage could have smiled, it would have done so.

Filled with a wild, ecstatic longing, the robot man hurried out of the house and onto the lawn. It was very still. The evening air of late autumn was frosty, but he did not feel the cold. Stars were beginning to twinkle. Jorgensen sent a steel fist clanging against his armored chest. Over the treetops, at the edge of the city a half mile away, the Moon rose, beckoning with a call like that of home.

Part Two of

THE MIGHTIEST MACHINE

by John W. Campbell, Jr.



. Nothing could stand before that frightful blast.

UP TO NOW:

It was Aarn Munro's idea—the Spencer Research Laboratory No. 6. Aarn Munro was the director of the research department of the Spencer Rocket Co., and, incidentally, Russ Spencer's best friend. Russ Spencer, rocketship designer, and grandson of the famous Russel Spencer who founded the Rocket company a century before, in 1979, was to see realized the dream of his father and his grandfather before him—a ship that could make the interplanetary journey without fear of meteor or thought of power shortage.

Aarn Munro's father had helped Russel Spencer II, the present Russ

Spencer's father, had taken part in the colonizing experiment, and, with twenty others, the Munros had been marooned on Jupiter—marooned because Jupiter's great gravity prevented the early rockets from leaving the planet after landing.

Aarn Munro was born there; he was twenty before he saw a ship land that could at last escape. Then, the Jovian-born human, superhuman in strength and speed from Jupiter's harsh training ground, had studied at terrestrial universities.

Now, Spencer, Munro, and their close friend, Don Carlisle, head of the chemical-research department of Spencer Rocket, have embarked in Aarn Munro's latest ship-laboratory, the No. 6.

Aarn's three great inventions are getting their first tests—the antigravitor, the transpon beam, and the momentum-wave drive. The antigravitor makes possible their "aggie" coils, storing the tremendous power their projected, conducting transpon beams steal from the mightiest machine that ever was—the Sun, and the momentum wave makes possible their drive.

Following the wave theory of the atom, Aarn learns how to produce in actuality the waves the theory had predicted as being momentum waves—waves created artificially in space which ARE momentum. They are testing this new ship—their coils full charged—and for the first time in the history of space travel they exceed twenty miles a second, and multiply this old record by two thousand. At forty thousand miles a second——

At forty thousand miles a second their ship, officially the No. 6, familiarly the SUNBEAM, is protected against damage by three layers of force—the magnetic atmosphere, a layer of magnetic field that will stop any conductor moving toward the ship; the antigravity field, which tends to repel any body not already weightless; and the momentum-wave apparatus, which likewise hurls away anything that would tend to change the momentum of the ship.

At forty thousand miles a second the SUNBEAM had the momentum of a major planet—concentrated. And at forty thousand miles a second she struck a planetoid. The magnetic atmosphere blasted the hundred-thousand-ton mass of metal to gas—but it still had a hundred-thousand-ton mass. The antigravitor repelled it, and called on the great aggie-coil storage bank for support; the momentum waves lashed at it, and called on the stored power of a sun for aid——

The fabric of space tore open under that terrible stress. The SUNBEAM ceased to exist in time and space——

VI.

A BLAST of light that was almost physically painful struck Aarn Munro, and he moved restlessly, then jerked abruptly erect. He was facing the control window, and outside there he could see six strange ships, each about two hundred feet long, needle-slim, with a tiny visible control-room port, and a ring of projections studding the nose. And the nose of each pointed toward the *Sunbeam* steadily; only occasionally did one swing and dart suddenly to a new position. Powerful beams of bluish light were sweeping over their ship as they apparently investigated.

"What happened?" asked Spencer tensely, suddenly coming up beside Aarn.

"Struck a big meteor. Don't quite know what happened. Ever see ships like those?"

"No known and recognized shipyard of the system ever turned those out," snapped the designer.

"I didn't think so. Did you notice the stars beyond?"

Spencer looked, puzzled, at his friend, then out toward space beyond. But it wasn't, he suddenly realized, black space. It was silver. It flamed and glowed and sparkled like a curtain of the magnetic atmosphere. There were stars, great brilliant white-hot suns scattered so thickly that space could scarcely show through. The heat from those myriad suns was almost palpable even here.

"Where are we?"

"Don't know—only know where we aren't," replied Munro, his eyes darting swiftly over his instruments.

The ships outside were circling closer now. They had evidently decided the ship was totally dead.

"We aren't in the solar system. I—I've an idea. It seems rather fantastic—but it would explain it, perhaps. You have to admit we are at least one hundred thousand light-years away from where we started—farther really—because those suns I see out there would make the Milky Way a dim thing. The Milky Way flung across that bunch would show up as a dark ribbon—literally. Actually we must be a million light-years away. Or more.

"That's a globular cluster and it's about one hundred thousand light-years or more in diameter, at the minimum. I've spotted three supergiant, type-O stars. That's hot enough to melt the rivets out of a solar investigator at half a light-year. Those three can't be closer than one hundred thousand light-years.

"Those fellows outside are getting bolder. They'd come in but the magnetic atmosphere has them worried. I see it's still on. The momentum oscillations have broken down. A transpon beam lead gave way. The antigravity field has collapsed, and we're falling freely into the local sun. There is one, though we can't see it just now, and it must be a hot one. Look at the color of the light on those ships. It's violet—positively violet.

"They'll try to crack us soon. Take these controls. I'm going back." Aarn leaped. The artificial-gravity apparatus was still functioning, but an Earth gravity didn't bother Aarn much. He met Carlisle on the way back. Carlisle was looking over the air apparatus, which seemed to have stopped functioning.

"Your transpon lead has failed," snapped Aarn as he passed. "I'm going to set it up in a few seconds."

Martin, Spencer's man, who had been brought along in his capacity of chief cook and bottle washer, was just coming out of his galley, his head in his hands. The acceleration neutralization was not quite perfect down so far from the center of the ship, and when they struck the meteor, he had been somewhat shaken up.

"Martin—come along. And call Bob."

Bob was the assistant electronics engineer whom Spencer had brought along. Bob was actually Dr. Robert Canning, and besides being an electronics engineer, he was a clever and skilled mechanician.

AARN was in the control room. In fifteen seconds he had found the defective lead, cut it out with a pair of bolt clippers, and was disconnecting the studs when Canning showed up with Martin.

"Hey, lazy, get a new number twenty-seven lead. Martin, you get the liquid copper, will you?"

"Sorry—didn't come to right off. Saw the planetoid just before we hit, and passed out. What's the matter?"

Canning was back with the bus bar and snapped it in place. Aarn ran down the studs and painted it with the electro-copper solutions Martin brought, solutions which would make the two copper surfaces knit electrically, but not too firmly physically.

"Plenty—we aren't in the solar system—strange ships—looks like attack."

Aarn was busy with the sun beam controls. He was thinking rapidly, and changing settings slowly, he examined the aggie-coil charges, and found that the banks were still about one third charged. He tested the connecting transpon beams to the momentum apparatus. Something more delicate had given away, also, for there was no response whatsoever.

"Nuisance—isn't it?" said Aarn.

He dived aross the ship as though there had been no artificial gravity, then leaped halfway to the control room and took over the controls again with less than two minutes' absence.

"They've been sticking instruments into our field," said Spencer moving out of Aarn's way. "They probably detected your actions when you changed the aggie-coil-power distribution. What's up?"

"Wanted current. No great voltage," replied Aarn. "The momentum apparatus is dead, and Canning's working over it."

"The air's working again," said Carlisle, entering. "I've been looking at the stars. Where are we?"

"Too far away to say. I think, though, and hope, that we are in another four-dimensional space. We've gone from our universe to another one through perhaps a five-dimensional nothingness. Like going from one three-dimensional world to another three-dimensional world through a four-dimensional nothingness.

"That's a high-explosive torpedo of some sort he's sending over. I noticed they stripped the hide off of it."

A long, slim device, perhaps a foot in diameter, and twenty long had started out of one of the projections on one of the ships. "High explosive—or I'm a chemist instead of a physicist."

The torpedo drifted swiftly, under air pressure evidently, for about a hundred yards, then abruptly the tail became wreathed in smoke, and the thing hurled itself forward violently. It darted at the *Sunbeam*—and suddenly exploded halfway.

"Hmmm—pardonable mistake. They thought that brass and copper would be unaffected by the magnetic field. Stripped off the iron evidently."

Aarn was busy. He was checking, instrumentally, a dozen circuits. At last he called out: "Canning—test circuit MM 433-a."

"That's it," came back the reply. "Compensator broke down. The damping effect when the meteor struck was too great for it. Need's a whole new circuit. Take me at least four hours. Shall I start right now?"

"Well, if you can think of some other way of making this bathtub move, all right, but I thought fixing it might be best," suggested Aarn gently. "What else might we do? Get going."

Aarn was busy with something else. He had the television device working now and was rapidly fitting the heavy mirror-polish steel shutters over the ports of the control room.

"Martin—hey, Martin! Get busy slapping on the port shutters. Fast!"

"Why? Rays do you think?" Carlisle anxiously. "We have no defense at all."

"Yes—rays of a sort—light rays; nothing much more dangerous. But light rays could blind us. Remember that the televisor eye there is a photocell of the newest Dinwiddie type. They can handle the Sun's radiation at the surface, fifty horse power per square inch. Also, curiously, they are supersensitive. Result—we have an eye out there now that can stand anything any projectors they have can handle."

"Suppose it's a heat ray?" suggested Carlisle.

"Suppose it's your grandmother's pet boogey! Get this through your head, Carlisle: Any weapon that depends on pure energy to destroy is a

double-ended weapon, as deadly at the sending end as at the receiving, and probably more so. In other words, to project a heat ray requires the projection of, at least, ten thousand horse power in a beam of not more than half a square foot of cross section. That's not going to be any too bad. But if it's half a square foot at the receiving end, it can't be larger at the sending end, and will probably be smaller. Then it is bound to be more deadly to the projector than to the receiving surface.

"Same's true of anything of the sort. Bombs are like that. They blow themselves—— Ah—here he comes."

A RAY of light. It was a terrific stabbing searchlight intended for the sole purpose of blinding the enemy, if it was humanly possible. It would have been effective but for the fact that the televisor simply arranged itself for the necessary load and showed each ship as a single point of bluish light, not too bright. Then a series of splashes of reddish light began to spread over the surface of the magnetic atmosphere.

"I only fear we are like the oyster and the starfish." Aarn sighed. "They can't break our shell at the present rate, but, on the other hand, we can't run away for a while. But if they just go right on pulling long enough they may open us up eventually."

The pyrotechnic display stopped abruptly, the searchlights went black, and the television screen showed again the simple ships, their tiny noses an almost impossible target for any weapon.

"Those," said Aarn at length, "are what the old navies would have called destroyers. Speedy, probably, fairly powerful fighting weapons, and a very small target."

"What are they going to do next?"

"How in blazes do I know? I guessed the searchlights because it's obvious. The next may be anything from a radio-frequency pencil of energy designed to heat us generally—that being a possibility because, Carlisle, it starts out as electric forces, and doesn't become destructive unmanageable heat till it's absorbed, but it can't be used as a concentrated beam for cutting holes, because it won't focus that sharply. Or their next attack may be some kind of a tractor beam with which to tow us home where the big battleships can be turned loose on us, to crack the nut; or open the oyster, as I said before."

"What do we do in that case?"

"We help Canning with his repairs as much as possible. And at the end of about four hours, we run away from the bad boys. By the way, we're turning slowly, and we get a peek at the sun in a few minutes. I didn't look when I was back.

"Hmmm—our friends evidently chose the tractor beam. In this case a series of powerful electromagnets on the ends of cables."

The enemy ships were lowering toward them something cylindrical, and roughly fashioned, at the end of long cables. The devices came from somewhere behind, for the cables hung along the side of the ships.

Aarn smiled. "My brethren, we shall now demonstrate the old Australian custom, or 'How to Make a Boomerang go home and Spank Papa.' They went to the trouble of making those bar electromagnets to act on our unipolar field. Nice of them——"

Aarn was adjusting something, and he had a switch—a two-way switch—under his hand. The bar magnets the enemy were lowering were taut on their cables now, straining at the powerful unipolar field of the *Sunbeam*.

And with a gentle sigh, Aarn reversed the *Sunbeam's* magnetic pole. Instantly, the half-ton magnets were under the influence of a tremendous magnetic field of the same sign—and they were repelled with all the power that had at-

tracted them, plus a little extra Aarn had added to the field.

Straight and true the great lumps of steel shot backward and toward the needle ships. Two ships avoided their flying magnets, four were struck and dented, one actually torn by the great flying projectile.

"How sweet the uses of adversary!" misquoted Aarn. "But they won't assume we are dead any longer. The fact of life has been adequately proved."

Whoever "they" may have been, "they" didn't. The six ships spun with startling speed into a hemisphere, all ships pointing straight toward the *Sunbeam,* but so arranged as to offer the absolute minimum target, and the absolute optimum of effectiveness. Then they began running through their armory vigorously.

They started with shells. And they weren't all metal shells this time; a lot of them were evidently made of synthetic plastics, and they shot through the magnetic atmosphere unhindered, but now Aarn had reëstablished an antigravity field, and the great shells bounced one after another into flaming destruction.

THE TERRIFIC searchlights flamed again. And spheres of blue radiance. They shot out swiftly from the ships, sped straight toward the *Sunbeam*—and then started circling it. They circled steadily, swiftly, expanding slowly, glowing brighter, and staying at a uniform distance from the ship—a distance of about half a mile.

A shell struck one of them, and shell and blue sphere of radiance vanished together in terrific electric flame. Half a hundred of the strange spheres spun about harmlessly now, and when they came near each other, they shied violently away.

"Wavering planetary paths! That's controlled ball lightning! What I'd give for the secret of that!" gasped Aarn.

"Why isn't it striking us?"

"Circulating in the magnetic field. Say—look!"

The thermometer was rising. It was rising smoothly, and steadily. The room was getting uncomfortably hot, and their own bodies began to get warmer, perspiration stood out on them, and little blue sparks began to jump from bead to bead of that perspiration. Then their keys, their coins, all their metal objects began to have live sparks like a halo about them.

"Damn—ouch——" Aarn reached and held firmly to his controls. "Radio frequency—and plenty. Well—our turn now."

Something hummed vividly in the power room behind. A sudden explosion of air as tremendous power leaped into a transpon beam that smashed its way through the ship's atmosphere.

And a sudden white-hot globule of molten metal where an enemy ship had been.

The hum died, and the air exploded back into the partial vacuum the beam had cut in it.

Again a whine, a clap of thunder, and a blazing white-hot spot of light where a ship had been, exploding light.

"How sweet!" murmured Aarn, and swept his deadly probe about through space. He was using no power till the beam met substance. "It's the transpon beam working in reverse. It's supposed to take power from a sun for our coils. I'm taking power from the coils, and making miniature suns out of those ships."

Another ship suddenly blazed up and died, and then the remaining ships vanished abruptly as they raced away. The *Sunbeam* had raised its first blisters. Two of the remaining ships began to accelerate gradually, and then moved more rapidly away.

"They aren't all dead yet," said Aarn

respectfully. "Those boys make battleships. The darned things are so long, I'd have to melt down two hundred feet of ship before they'd all be gone. And they are supposed to be able to move. You know, I'll bet they haven't got any energy weapon like that transpon beam, and they probably wonder what manner of heat ray I have."

"I thought," said Carlisle, "that you said energy rays—rays that depended on energy for destruction—couldn't be made."

"I did. And I meant it. Figure it out," returned Aarn with a grin.

"I figure," said Spencer, "that the beam is not dangerous—it's what it carries. Does that make any real difference?"

"That's the answer—and it does," replied Aarn. "No sound can be heard three thousand miles away; no sound can cross space; but we can hear sounds which originate on Earth, clear out on Jupiter. How come? The sound doesn't get there—it's carried there by something else. Sound hasn't the penetrative power of radio.

"In this case, a beam can't be handled by a projector if that beam is so destructive to the matter of a ship. But now we have the transpon beam which doesn't destroy—it's quite a harmless little thing, perfectly innocent. Only somebody poured poison in it. It conducts.

"Here's an illustration of the case. Take that piece of wire there—a piece of copper. I can truly and safely say that a wire as thin as the lead of a pencil can't be made the shaft of a machine carrying ten thousand horse power twenty miles. Impossible! But that doesn't mean that ten thousand electric horse power can't be conducted through it. As a driving shaft, as direct mechanical energy in other words, it would be impossible. As a conductor for a second-hand energy, it is possible.

"In general, the only effective rays possible as weapons will be in two classes, the catalyst rays, and the conductor rays.

"By catalyst rays, I mean rays which cause effects at a distance, not by doing work but by giving a signal. A radio beam that releases the explosion of a ton of dynamite might come under that class. A death ray would also come under that class. A ray which set up interference such that the fleet could not communicate, and hence the signals were misunderstood, would also be a catalyst-type beam.

"The conductor beams are, of course, such beams as the transpon.

"The enemy have retired in disgrace. What next? Where do we go from here?"

"Find out where we are first," suggested Spencer.

"The ship's got to be fixed up before we go at all," Carlisle reminded him.

"Oh, I know it! And I know now as much about where we are as I can in less than five years. We are in another space. I know why we are in this particular other space, too. This space is in a sort of strained condition already. Look at the size of the stars we can see. I recognize a number of spectral classes there, and every dog-goned one of them is a supergiant! This is a globular cluster of gigantic stars."

"How can you tell, only glancing at them?" demanded Spencer.

"Experience—I am really guessing, but it is a pretty fair guess. Those spectra look hot. Even allowing for the fact that the light is slightly changed due to different space conditions here."

"And what if they are supergiants, why does that explain anything?"

"We got here by passing through the wall of our space, into a sort of fifth-dimensional interspace. From that interspace we had to enter some other normal four-dimensional space, because we weren't normal to that space at all.

Then we took to the one which was easiest of entry—this one, which is strained almost to the breaking point in spots, itself, or at least far nearer that point than any other normal space.

"Those enormous stars simply make great strain spots in the fifth-dimensional interspace side of these spaces. Those strains in the surface attract any unnatural strain in the interspace. Probably anything that leaks through from any of those other spaces ends up in this space."

"Why near this particular star, then?" asked Spencer. "By the way, I haven't seen it, and I'm going back to look."

"You needn't. It's just a bright spot, and you couldn't tell a thing. I'm going to take some readings presently, and send out a sunbeam and get some results. I've started warming up the tapper tubes. If my suspicions are correct, this is a huge star, far larger than the average, even here. That particular strain spot attracted us."

"Why didn't we land in the star then?"

"What threw us through here? A collision? Do you think we went through just so we could have another and be sent back? Naturally we rolled off the sides of that star's field to some extent before breaking in here."

"Then this is the biggest star in this space of supergiant stars! Wheeee——"

"No; it doesn't have to be at all, Russ," replied Aarn. "It is probably the nearest-biggest star in this space to the side of our own space through which we came. Get it?"

AARN was working over his instruments now, making adjustments and readings. Gradually a look of puzzled amazement came over his face. More and more carefully he made adjustments. At last he sighed gently and looked up.

"Sweet stellar cycles! It's a Cephid variable or I'm an asteroid. And it's a Cephid of a class you and I never even heard about. Russ, you must be right. That must be the largest star in this whole darned space of supergiants. It is a Cephid with a period that can't be more than a few hours at the outside; it's tremendous. It's gigantic. Maybe it isn't a Cephid, but a different kind of variable that's twice as big.

"I took a radiation measurement on it, and at our present distance it's about as strong as sunlight, but the maximum is in the blue range. Then I took a gravity reading on it and a few other readings—electronic and magnetometric.

"The answer seems to be that that little foot warmer is about one hundred million times as bright and potent as old Sol! We are ten thousand units from that sun's center! About, that is to say, ten thousand times one hundred million miles, or about one million million miles. In round figures, at a distance of one trillion miles, this sun is as hot as ours is at a distance of a hundred million. Shall we go lay an egg on its surface?"

"Great orbits! How big is the thing?" gasped Spencer.

"It's hard to say." Aarn sighed. "I'd like to know accurately, and will, of course, later, but all I can do is estimate from the known effect of the gravity decline. It seems to be of the order of five hundred million miles in diameter at present and growing larger."

"Larger than Antares——" said Spencer softly.

"But Antares isn't as bad as this, man. Antares is cold. Its surface temperature is so low it doesn't compete. It has a temperature of about three thousand. That thing—Heaven alone knows what the temperature is. I can't tell after the light has struggled out against that gravitational field. That field must drag it back through six shades of blue."

"How do we get power? Tap that thing? Say, the Sun is a mild little old dry cell, plugging along peaceably. That's a dynamic, roaring, pulsating furnace."

"We can tap anything," said Aarn firmly. "I've already started the beam."

"Haw—when do we get power? Next year?"

Aarn sat slowly upright and looked at his friend in horrified surprise. "I didn't stop to think. One trillion miles! Over fifteen hundred hours!" Aarn's face paled slowly. "We're stuck unless ——" He fell silent and thoughtful.

"Are there any planets?" Carlisle interrupted him.

"Eh—planets?" Aarn looked up, annoyed. "Dozens. Couldn't separate their effects."

"Dozens?" gasped Spencer. "What kind of a system is this?"

"Those planets," said Aarn, "were probably the throw-offs, the bits of matter swept out by the natural antigravitational fields. On stars that size, there must be billions of tons of stuff thrown off every week. That stuff gets swept up and turns into planets. Probably, though, the process actually is kept going by frequent passages of near-stars. In a globular cluster, where the distances between stars aren't more than a light-year or two, and the darned things have gravitational control extending for nearly that far, the effects would be rather powerful, and more continuous.

"We are probably moving in an orbit such as a meteor might follow, else we'd be bathed in them. I'll bet worlds here have a constant shower that's worse than the Leonids or any other shower back home."

"Nice place for space ships."

"What of it? You can't change things. Look—that star there. I swear I can see a disk, and it's so bright I can scarcely look at it."

"Sunlight from this sun is coming in —we're turning," said Carlisle almost simultaneously.

A stream of almost liquid blue light cascaded through one of the ports in a thin, thin crescent, and struck the opposite wall. A bright, harsh blue competed with the gas-glow lights.

"If we want to get away from here before those ships go home and tell mamma, we'd better do some work," suggested Aarn. "Canning," he called, "how you making out?"

"This cockeyed, misbegotten inspiration of a half-baked imbecile has more misconceived and willfully aborted circuits than a centipede with locomotor ataxia," Canning roared back. "Come here and see if you can figure it out; I'm about through."

"Spencer, will you take that over? I've got some things I want to do," said Munro. "Want to make some calculations."

"Right enough. But what calc have you in mind?"

"How to go faster than light." Munro grinned and vanished toward the rear.

"All right; don't tell me if you don't want to," snapped Spencer.

MUNRO found Canning engaged in trying to replace the various pieces of apparatus he had been forced to remove to get at the defective circuit. The actual repair had been made, and within twenty minutes he'd have it back together. Then would come the delicate task of tuning the device.

Hour after hour passed as the two engineers struggled over it, and Carlisle and Aarn, both excellent mathematicians, struggled over the math machines.

They had got their first glimpse of the sun when they went back to the calculation room, a bright blue disk, little larger than some of the very near and very large stars.

"There must be a planet near here,"

said Carlisle, "or those ships wouldn't have been out here."

"There must be two," replied Munro, "two, or more. Those ships were loaded for b'ar, and that means either they were pirates preying on commercial interplanetary shipping, or police, after any strange craft or, far more probable conclusion, warships.

"Either of the first two presupposes other space craft. There are no space ships if they have no goal. Hence, two worlds. War rockets for planetary war wouldn't be attacking strange ships millions of miles from home. Interplanetary war is indicated.

"Further: They are near-by planets, because of the size of this system. Do you realize that those planets must have orbits with circumferences of the order of three trillion, one hundred and forty-six billion miles?"

"Interplanetary war wouldn't last a year here!" Carlisle laughed.

"Hmmm—maybe it would last that long, if it wasn't too active—if the forces were too nearly matched. Remember a year, though, would be about eighty thousand of our years."

"But the planets would get so far apart! If they were on opposite sides of their orbits, the contestants would have to quit. Suppose we were fighting Mars, and Mars got on the other side of the Sun. We'd probably declare a temporary peace."

"Yes; true enough. But if Neptune and Pluto were fighting, it would be a thousand years before one would get on the opposite side of the Sun. Here the case is even more extreme, because the difference in their orbits is so small a per cent."

They set to work, though, while the blue disk of the sun crept slowly across their port, and "sank" on the other side. Martin declared a meal, and announced it, while still Spencer and the too-optimistic Canning labored over the job that was to have taken four hours.

After the meal Aarn seemed strangely pleased as he considered the results of the mathematics. Carlisle had performed a number of derivations for him, but had not understood the meaning of the results, as had Munro.

"What is it that's so pleasing?" asked he, at length.

"A chance to go places," replied Munro with a laugh. "I have some apparatus to make. Canning can have that job, while I finish his."

"All right by me, I assure you. My job is distinctly discouraging," snorted Canning.

Aarn grinned, and showed the mechanician-engineer what he wanted made. The man become more and more puzzled as he examined the pattern.

At last he said: "I can make the thing, but darned if I can see why."

"I can," said Munro simply. And that was that.

In half an hour the physicist had done what the engineers had been unable to accomplish, for, when he applied himself, Munro could do delicate work. The circuits were balanced, and he tried them out a bit. The ship moved gently and turned about.

In another hour the simple-complex device Aarn had requested was made. It looked, and was, mechanically simple, but its theoretical implications were enormous.

"Now you have it, what have you?" asked Spencer.

"Mahomet's decision." Munro grinned.

"Oh, blazes, what is it?" snapped Spencer.

"Mahomet's decision," replied Aarn evenly.

AN ALARM chose that minute to make its presence known. Aarn jumped. "Great Jupiter—they're back. I'll bet papa and big brother Bill are along to——"

He was out of hearing in the control room. In an instant he was in his seat. A far-flung screen of magnetic force had been disturbed by the approach of a fleet of eight ships. Two were recognizable as the undamaged members of the late adversary. The rest were new.

They were of two new types. The long needle shape was missing in them, and promptly Aarn realized he was seeing now space cruisers and battleships. The two little destroyers led the way, darting rapidly from side to side. Slower, four greater cruisers came up, and behind them two great battleships.

Spencer gasped. "Great planets and little asteroids! It's a battle fleet."

"The destructive beam. They must want the secret of that thing. We're sunk. I'll bet those battleships have noses of ten-foot steel, and the walls for a hundred feet back must be the same," Aarn replied.

A great battleship turned slightly askew, and they got a glimpse of its length. It was a full thousand feet in length, with a series of projecting turrets along her sides and top.

"What a monster—and two of them." Spencer stared aghast.

"The cruiser's not bad," said Munro judiciously.

It wasn't; it was perhaps six hundred feet long, with fewer and smaller turrets, but still a far, far different thing from the destroyer.

As yet the enemy were looking over the *Sunbeam* with caution.

"I wish," said Aarn, "that the aggie coils were full. I'll have to start carving on that battleship, or they won't believe me, and if the thing is all metal, they may be able to get rid of the heat. If it is by any chance silver, we're sunk before we start."

Munro had been busy. With a sudden flick of his finger, a series of relays shot home, and suddenly great beams clapped into action behind him somewhere. And on the bow of the great battleship appeared a spot of flaming, white-hot incandescence. It grew and spread, and the ship jerked wildly.

A great mass of white-hot metal was thrown off by the motion of the ship, and a pit five feet across and two feet deep was left. The beam found lodgment again, and again the metal burned white-hot.

The enemy fleet went into action with their heating rays, their greatest guns, and far greater lightning balls. No result, because of the magnetic atmosphere, from any save the induction ray. The *Sunbeam* became unbearable.

Aarn shifted his attack from the almost-impregnable battleship to the nearest cruiser. A five-foot hole appeared in her side, drove swiftly straight through her interior, and smashed its way to her power compartment inside of fifteen seconds. The control cable had been severed before the ship could be moved, and before a second control could be brought into action, the power storage was reached.

The cruiser disintegrated in the most frightful burst of sheer blue-white incandescence the solarites had ever witnessed. Enormous chunks of flying metal smashed their way through everything within range—save the magnetic atmosphere and the terrific walls of the battleships.

One destroyer was riddled and rolling away a lifeless hulk. A cruiser was wounded and moved hastily away.

MOMENTARILY the attack on the *Sunbeam* was stopped. The terrific heat did not abate, but the painful, continuous electric sparks did.

"It's a wonder our circuits don't go dead under that," said Spencer.

"To much metal—too much grounding—too much shielding of every sort," snapped Aarn.

He spun his controls, lined up his beam, and let go at another cruiser. A

white-hot needle smashed its way through the outer wall of two-foot steel, and an inner wall of one-foot steel, and was messing up a kitchen within, when the ship darted away.

"Our coils will be dead in about one and a half minutes." Aarn sighed. "Once I've discharged them——"

He lined up his beam and let it go again. This time the damaged battleship received the dose where it had been hurt before. The metal incandensced and exploded outward in a stream of white-hot sparks. The beam punished its way through an inner one-foot wall and ate a channel straight through the heart of the great ship in a matter of split seconds, for under that terrific drive, a wall of metal only an inch or two thick meant almost nothing at all.

It struck the engine room. To do so it ate its way through another one-foot wall, but something was the matter, and the great ship was unable to move. The engine room of the battleship was suddenly an inferno of white heat that spread like a widening pool, eating at the heart of the ship. A dozen trapdoors all over the ship opened, and tiny forms shot out into space, making swiftly for other ships.

"I hope they retire," said Aarn wistfully. "We've got about enough power left to cook dinner, and I'd hate to use that up too."

And then—from somewhere behind—something white and gleaming, a long slim body, roared forward. It was twenty-five feet long, and not a foot in diameter, but it had a rocket motor, and it had intentions of damage. It missed the nose of the battleship, which was still in good condition, by about two feet and a skillful maneuver, and struck the injured battleship. A series of explosions that lasted a full thirty seconds followed, and when they were over, the rocket torpedo had eaten a hole through the four-foot armor and was floundering about inside the ship.

A flock of those torpedoes was flying now, and all directed toward the attacking cruisers and battleship. Shells seemed to be invisibly on their way, for huge gouts of white flame sprang up all over the great metal walls and pits appeared. Occasionally a trapdoor was found, and then a great pit appeared which was immediately the target for a hundred shells.

The attacking battleship had evidently had more than enough. It retired rapidly, and for the first time the solarites saw their rescuers.

Four great battleships, eight cruisers, and a fleet of destroyers. Every one of those ships was shaped almost exactly like the *Sunbeam* herself, with lines distinctly at variance with those of the other fleet's ships.

"Now what?" asked Spencer in a tired voice. "Do we fight or what?"

"We what," replied Aarn. "They must be friends. They evidently consider any enemy of their enemies a friend. Very useful frame of mind. Probably just as interested in finding out how in the name of blazes we burned holes in that battleship as the enemy were. We've got to signal. How? They don't know what's a beam of destruction and what's a beam of light. And we haven't any more power to argue with, except for what's in the indispensible magnetic atmosphere."

"Can't we signal from——"

"Ah—power!" interrupted Munro, with a smile of pleasure. "That's an easy signal of friendship."

"What is? That we've got power?"

"No; that we haven't. The man you do a favor for," said Aarn, working rapidly, "is twice your friend."

THE LIGHTS aboard the *Sunbeam* began to fade slowly, growing dimmer and dimmer. A searchlight reached out suddenly from the solarian ship and died slowly in redness as the lights faded rapidly to darkness. The strang-

ers watching from outside saw a number of small bobbing lights move about inside the ship. Presently a doorway opened, and a light, a dim, dim light shot out in a curve, something trailing along behind it like a tail.

A destroyer maneuvered cautiously over to it and picked up the dim light and the trailing thing. It was an incandescent bulb. The trailing thing was a piece of twisted pair wire, the wires connected to the bulb. It was a very dim bulb. It told a long, and complete story to the highly intelligent men of the Magyan ships.

It said in brief: This ship uses electric power. It has used all its power in fighting, so thoroughly that even the lights have failed. This wire has been tossed over to us that we may supply power. It gives us a means of measuring the voltage of their power system, determining whether they want a. c. or d. c., and many other things are suggested, such as the fact that the stranger ship is indeed in trouble and lost.

The Magyan destroyer captain consulted his superiors, while his engineers made tests on the wire. The voltage they determined. It was about a hundred and eighty-six, on our scale. They then connected the light bulb to a source of potential and ran it up till the bulb was glowing at the greatest safe temperature. The voltage they used in this was two hundred and thirty. Therefore they pumped over current at two hundred and thirty volts.

Immediately the lights on board the *Sunbeam* flashed up once more, and three solarites gave a cheer of joy.

"Step number one!" called Carlisle.

"We've got to talk to them. Let's hope their language isn't too hard," mourned Spencer. "I never was good at languages."

"I think I'd better stay here," said Aarn, "and finish fixing this boat. You'll have to go over there—— Whoa, some one is coming. Spence, take the control room. I'm working in the air lock, and I intend to pass that bird right into the lounge. Meet him there."

For the first time the solarians got a view of a Magyan. Anto Rayl was to be a friend to them. He was six feet tall, and absolutely human in every character.

His eyes were gray, with speckles of golden color floating in them, his face was tanned deeply, a lean, strong face with wide, high cheek bones, a straight, thin nose with delicate nostrils, his chin firm and square, his hair was black as space and cut square and short in front, with a straight bang across the back of his neck.

His uniform was some woven-elastic fiber that evidently was capable of stretching in all directions. It fitted him closely, revealing a body that was muscular and well-proportioned. His chest was deep and wide, and his bones strong.

He looked at the Terrestrians interestedly and with some peculiar anxiety and surprise. His eyes darted swiftly about the power room, and a slight look of disappointment came into them, for absolutely nothing was readable to him now, since all the mechanisms were covered, as understandable as an automobile with the hood down.

Then suddenly he noticed the form of the Jovian, half hidden where he had been opening the lock door.

The Magyan slowly pulled a tiny metal tab, and the absolutely transparent envelope that had protected him in his short trip across space fell away. He was still looking at the Jovian, and at last turned away, a distinct look of displeasure on his face. Aarn was himself annoyed by this—then suddenly grinned widely. He laughed softly, and the Magyan turned toward him.

Aarn stepped forward with a friendly smile and stretched out a hand in greeting. Hesitantly the Magyan reached

out his own hand. With a slight smile, Aarn shook hands, keeping his fingers flaccid. The Magyan would learn the Jovian's strength later.

"Greetings, friend, and you sure fill the definition of a good one!"

"Ahtop ah-menahep—etran matral hepanet."

"Hmm—we won't get anywhere that way. Look," said Aarn distinctly. "I am—Aarn."

"Aarn?"

"Yes—Aarn. He—Russ. He—Car."

"Ahm—Ahm—Aarn—Russ—Cah."

"That's it. Who are you?"

"Anto Rayl," replied the Magyan.

"Anto Rayl. Good! Now to learn a language. It had better be theirs if we possibly can. Let's see. How can I ask?"

Spencer smiled. "Easy!" He picked up a chair that was near by, held it before him, and pointed with his other hand. "Chair," he said distinctly. "What?" he inquired.

FOR A MOMENT Anto Rayl was puzzled; then he grasped the idea. In a moment he had pulled a small instrument from his pocket and was talking rapidly. Aarn looked at the thing closely and reached forward and pushed it away from him. He shook his head, and then put a hand to the instrument. His hand undulating, he moved it across the room till it struck the metal wall, then he simply smashed his hand flat against the metal.

"No. Won't go."

It wasn't the metal. It was the magnetic atmosphere, but there was a wall which radio wouldn't penetrate easily.

In an hour, a teacher had come from one of the other ships, a skillful artist. He, with Anto Rayl, started teaching them, and evidently Anto Rayl's people didn't know the meaning of fatigue, for they kept at it for ten hours straight. And it was a pure, intensive course. So intensive, and so purely lingual, that absolutely no information passed.

In the meantime a heavier cable had been run in from one of the battleships, and the great aggie coils of the *Sunbeam* were slowly being charged. However, Anto Rayl did stop once to inquire where in the name of something or other all the power was going to. It seemed that about one quarter of the battleship's power had been sent over, and that was all they could spare.

Aarn grinned and took Anto Rayl to one of the doors in the wall of the *Sunbeam.* Behind was one single group of coils. Aarn pointed to them, and indicated they were about one tenth full. Then he pointed to another group barely visible, and indicated they had no charge at all. Anto looked incredulous.

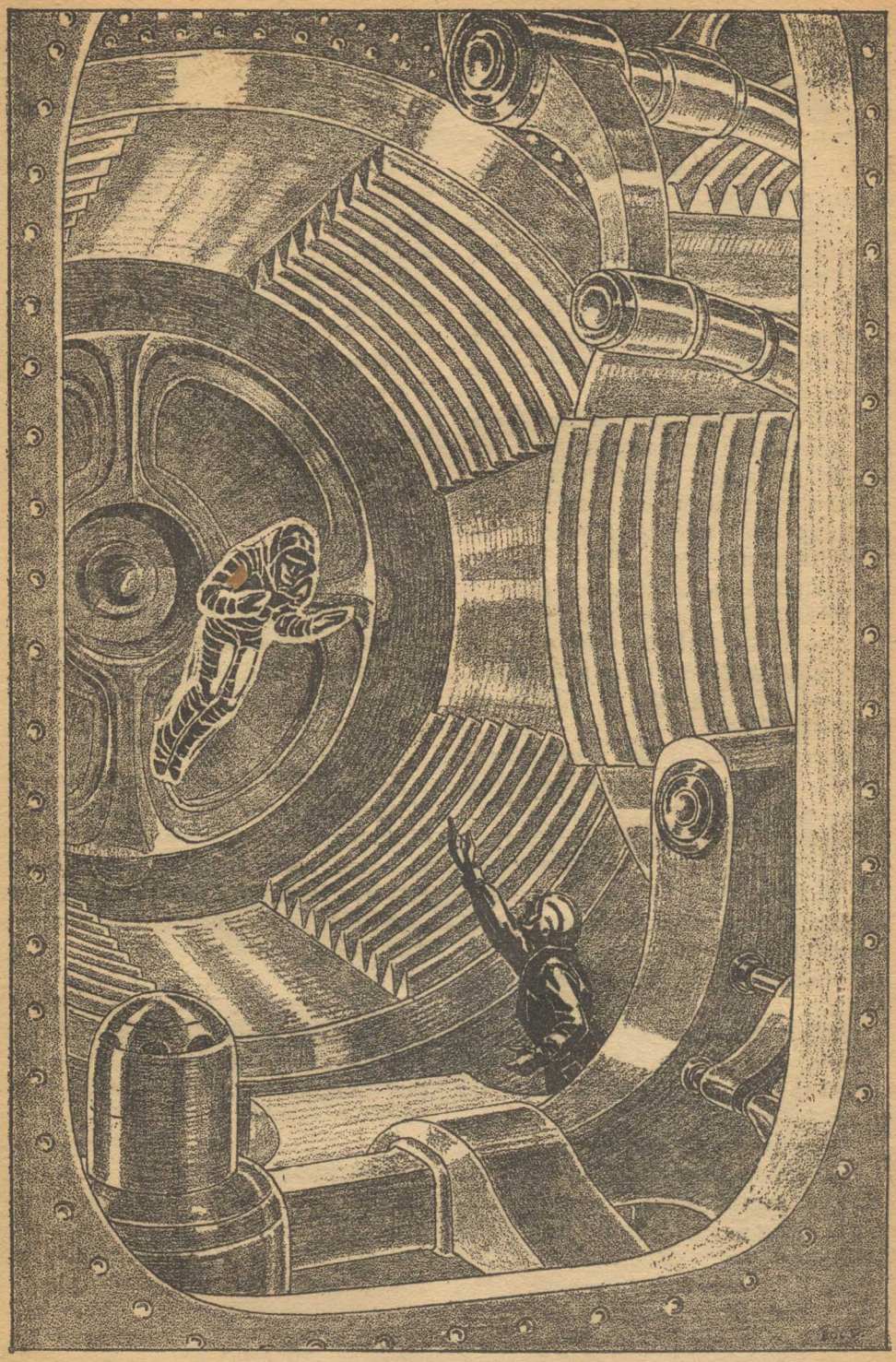
The labor of learning a language, even passably, is terrific. It is so great that the author of fiction invariably is tempted to resort to telepathy as a short cut. Aarn and his friends retired with the firm conviction that some such thing was badly needed. All they seemed to have learned was an incredible number of words, such simple words as "go" and "away" and "be" and such, and they realized that they could not so much as give a sensible sentence. "The chair is up there," was about their limit.

"At any rate," said Spencer with a groan, his head between his hands, "they don't go in for declensions, conjugations, and dual, plural, and singular voices, and there seems to be some rhyme and reason in some of it, anyway."

"Maybe," said Carlisle disgustedly. "Also a headache."

Martin had breakfast ready when they awoke in the morning, and Canning announced that he had finished the connections Aarn had prescribed for the new apparatus.

Anto Rayl was not back yet and did not show up when their activity began. Aarn went over Canning's connections



Then he noticed Aarn.

Illustrated by Elliot Dold

and tested them carefully. Next he took some power readings and determined that he had enough power for what he wanted to accomplish.

"This," he said with a smile, "will surprise our friends immensely. It will also surprise you."

"It will," agreed Spencer. "You haven't yet told your employer what you have been doing."

"My employer has become merely a supernumerary here." Aarn smiled. "We are about to go to the mountain, if you must know."

"You mentioned that," replied Spencer. "I took it to mean that since Anrel—as Anto Rayl called the sun here—won't come out along your beam in anything less than half a year or so, you plan going there. Fine! Just tell me, though, how, in the sacred name of the nine known planets, you expect to accomplish that which every physicist since Einstein has said was impossible."

"None of them said it. We've already done it."

Spencer looked at him silently for a moment. "All right, I am a liar. Now prove it."

"How far is it back to Earth?"

"Uhhh—that's not a distance."

"All right, then. We aren't going a distance. Only we're going to wind up somewhere near that sun," said Aarn, and started putting up the remaining shutters.

All but the ones in the pilot room were up. In a moment only the television served to show them the Magyan patrol about them.

"Well, good-by," said Aarn.

He depressed a control. Instantly the Magyan patrol became a two-dimensional picture of a Magyan patrol. The battleships were silhouettes, and the whole thing vanished in a puff. The sun, Anrel, alone remained unchanged as minute after minute sped by. Then, at last, even it began to show signs of growth. But something else was growing off to one side—a world that flashed larger and larger, that twisted and turned as their ship fled past it at a velocity that was preposterous, impossible.

"We aren't," explained Aarn, "really going through space. We're going round it and keeping contact rather slightly. We're half out of space. We had just enough power to build up that condition, thanks to the Magyan battleship."

"How fast are we going?" demanded Spencer.

"We aren't," said Munro blankly.

"Grrrr—how fast would be going if we were?"

"About twenty-five hundred times as fast as light. That means that where light would take about fourteen hundred hours, it will take us a bit more than half an hour. We won't go all the way, though. I'm stopping several million miles short. And making another slight modification in space as soon as I get the power."

THE SYSTEM was simple enough, when understood. The ship, in crossing from one normal space to the other, was in an interspace where it did not belong and was instantly shoved to a place it could exist. In being pushed through that strange interspace, the meaning of distance was forgotten. It could have alighted anywhere in the other space. Aarn was intentionally shoving himself halfway out of the normal space into that interspace and then coming back where he wished.

Anrel grew larger. The great blue-fire disk grew with astonishing slowness, for they were covering billions and hundreds of billions of miles with every second. But the titanic sun was so distant that, even so, change was slow.

"That's about enough," Munro said at last, when Anrel was a disk of blue fire that spread over half the firmament, blotting everything else from sight.

The television eye was cut down to a minimum, and a diversion-shunt circuit called into play to handle the enormous influx of energy. The temperature of the ship was rising rapidly even here in the interspace condition.

"Look out!" warned Aarn.

He cut a switch. Instantly he threw a second. In that momentary lapse of time, the shutter before their eyes had grown red-hot, and the television screen was blank.

"Radiation!" Spencer exclaimed and fell silent.

God's mighty experimental laboratories, the suns of space, did make the weapons of humankind seem futile. The mere exhaust energy of this star had nearly fused that heavy metal shutter in a fraction of a second.

"What's cooling us?" Spencer asked at length.

Aarn was silent—and busy. "I'd like to know this sun's frequencies better——"

"What's that mean?" asked Carlisle.

"It means I may hook onto about a million times as much energy as I want," replied Munro. "And we aren't being cooled. I worked this out from the same interspace idea. That interspace experience was a great thing for me." He grinned. "I've made the ship invisible."

"Invisible?" gasped Carlisle. "I can see it——"

"Certainly, defect. But it's invisible from outside. I've shunted the incident electromagnetic energy through ninety degrees into gravitomagnetic energy, and back again on the other side. We aren't absorbent to gravitomagnetic radiation, and it passes right through."

"Gravitomagnetic—what's that?"

"Electromagnetic energy is energy which is cyclicly transformed from an electric field to a magnetic field and back again, and possesses the property of traveling as radiation through space at a speed of a hundred and eighty-six thousand miles per second. Gravitomagnetic energy is the same, except that the change is between gravitational and magnetic fields."

"Does it occur in nature?"

"Naturally."

"Why hasn't it been detected and used before this?" asked Spencer.

"I just gave the reason. It passes through any physical body unhindered. Only certain force fields can detect and handle it. I detected it against my gravitational fields, naturally. It won't go very far, anyway, before it gets broken up into a different form of energy. I think it's the source of cosmic rays. Gravitational fields tend to combine, and unlike electromagnetic radiation which always goes down the scale, gravitomagnetic radiation is willing to go up the scale.

"That beam ought to be getting near the surface layer now. I've got it cut down to nothing. I hope it leaves me something either of the power or the ship." Aarn read his instruments carefully.

"Anyway, here is the result. I can get near this sun, by-pass the radiation, and live to tell about being here."

"Is the television burned out?" asked Carlisle. "I'd like to watch that star."

"I just got through saying that the light and heat were by-passed," said Aarn patiently. "We can't see out. I can make a small hole in the screen if I want to, and I'd not live long enough to close it."

"Will this invisibility be useful in fighting! Oh, oh! We'll have some fun with the—Tefflans, Anto Rayl called them."

"Wrong," replied Aarn, his eyes on the instruments. "They'd spot this field a billion miles away, when they couldn't see us at all if we were in normal space. That beam is just—about—here."

He waited expectantly, the whole ship quiet in suspense. Still minutes passed.

"It didn't get anywhere at the outer layer," said Aarn softly. "It's going deeper."

A DEAFENING explosion echoed through the ship, a tremendous glare of blue light that burned through it, a deep-throated hum of rushing power that made the entire ship vibrate with its beat. Rapidly Aarn was cutting down the power.

"Everything's—full—nearly."

The power died, the blue glare faded gradually, and finally was gone.

"Done!" Aarn sighed as he cut his beam. "Got a stock of power now that counts, and I'm going to have more shortly. If we want to get back, Russ, we'll have to rip out some of those nice extra bedrooms, and the lounge goes, and the lab will have to be filled with coils. That lab can be set up on Magya and we can work from there as a base. It may be years before we get back, for we've got a thousand observations to make. We've got to find our own particular space to get back to. It has no extra-great tension so that we can find it easily."

The ship seemed to reel, then suddenly the television was working again; it showed the star spinning across the screen, then rapidly retreating as they headed back to the Magyan patrol.

"How will you find our space?" asked Spencer after a moment of horrified thought. He'd not thought of that angle.

"Take a chance, largely, if necessary. The quickest way home, if it will work, is to go after the space fields of antigravitor apparatus. We know they have that on Earth, and it isn't like a natural field, so we know intelligent beings live there.

"But they may not be our intelligent beings, and we may simply land in a third space. There may be a way to localize the thing, though.

"But first—I'm interested in the Magyans. I noticed something you may not have done. What's their word for mother?"

"Matra," replied the puzzled engineer.

"Father?"

"Paldri."

"That's the thing I noticed. Just think. See if it isn't a series. Padre-pater-paternal-Vater-father-pere-paldri. And madre-mater-mutter-mere-mother matra. I swear those similarities are not chance. There were others I noticed. That is an Earth-human race. They were perfectly, absolutely human. You saw that.

"We're getting back to that squad now, and I'm going to learn their story. They're too human to be anything else. And this is the place where anything cast adrift from the planet would inevitably land. I want to hear that story—and about those Tefflans. I saw—one of them. Did you?"

"Saw one? When?"

"In the battle. It was red. And—it wasn't human. I hated it at sight. It was—a devil! Tail—horns——"

VII.

ANTO RAYL eyed them uncertainly as he entered with the artist-teacher. "Where did you go?" he asked.

"To the sun," replied Aarn, almost as surprised to find he could answer as at the fact that Anto had asked an intelligible intelligent question in the new language.

"You went red, then went black, then went out of seeing," said Anto Rayl.

"You can make sense with those fool words we learned yesterday," said Carlisle.

"We went to the sun. The sun is far. We went fast. We went more fast than light, so we went out of seeing," Aarn answered Anto.

Anto looked puzzled. His question was quite evident to the Jovian. He

was puzzled, because he knew that nothing could go faster than light, and because these men were learning the language. Now the strangers might be able to do the impossible; on the other hand they certainly could get mixed up in their language.

Aarn spoke again: "We went fast—very, very very more fast. So fast that light was slow. It went red, then more fast, and it went black, so we went out of seeing."

Anto smiled his understanding. "Why?"

Aarn explained briefly, and with every word and phrase his surprise and shock grew. He found himself talking a sort of pidgin language that consisted principally of basic, simple ideas such as go, be, live, die, power, fast, slow, heat, cold, air, and such, and a number of modifiers. The result was a language which lacked all signs of beauty or nobility, but had every possible desirability as a quickly, easily learned language. One did an enormous amount of "going" and "being" but the result was intelligible.

To attempt to maintain the peculiar jerky style of that simple but ungraceful language is useless. In giving Anto Rayl's story I abandon it completely for the English translation which gives the thought, not the words.

Anto Rayl listened with astonishment to Munro's description of the source of the *Sunbeam's* power. He gaped in amazement and stared with a new respect at the hulking form of the anti-gravity field. No ship of theirs had ever attempted to approach the sun, not only because of the terrific distance—so great that it would have taken a lifetime almost for a space ship going at any safe speed—but because of the terrific gravitational field.

"Doesn't that enormous energy burn out that coil? If it contains energy sufficient to lift this ship those trillions of miles against the terrible gravity of Anrel, I should expect it to be consumed," he said wonderingly.

"It doesn't contain the power. That's the point. Quite the opposite. It keeps the space around it from containing that energy. It prevents the energy's existence. Therefore it contains none and is under no strain."

"But the power coils?"

"An altogether different thing. They build up a field instead of tearing one down.

"But tell us your story. We feel sure that your race and ours are blood kin. How can this be? We came through the wall that leads from space to space."

"MANY, many, millas—periods of a thousand-thirty-hour-days—ago, in a world on the other side of the Wall of Naught, our forefathers lived," said Anto Rayl. "It was a green world about the size of Magya, but slightly smaller, and made up of fair lands and broad seas. And in the middle of the greatest sea of all, lived the Ma-jhay-anhu, the mother race.

"They built great cities, carved great monuments on their broad, flat continent, and developed a great civilization. They were a people who roamed little, who multiplied slowly, and they did not search the world and colonize it widely. As their ships grew greater, and their air flying machines came they visited all the continents. In some they found wild savages, hairy and bestial. A different race altogether. They were almost apes. Colonies were not needed, none established.

"Then—the year of the calamity. There was a shaking of the ground, and a great cleft appeared in the side of the sacred mount, where lived the rulers of the Ma-jhay-anhu. And from it came the Teff-Hellani. They were—something else, a misbreed; something the processes of life should not have produced. They were, we believed, the

result of the evolution of a strange crossing of utterly different races, the primates and the goats. A million years ago, perhaps, these things had been locked under the Earth in a vast system of caverns beneath the continent of Mahu, and in the strange light of strange elements they developed.

"Their faces were long and narrow, and they had horns, but their eyes and their noses and their mouths were something like those of humans. They had a torso and a pair of true hands, but their feet were the feet of goats, and their bodies were hairy. And the strange light had bred something into them that made them red, for the light was greenish in hue. They were hideous. It was hot in those depths, and they loved heat. Only in summer could they endure the outside air. Then they were always hugging great fires.

"But they were intelligent, and their vitality was terrible. They were carnivorous. They captured our people and carried them off, women and children—for meat supplies. They had never had any before. They bred them down there in their foul caverns, and some few escaped to tell of the horrors.

"And the Ma-jhay-anhu fought with more and newer weapons. Those two races hated each other instinctively. They always have. They always will, for that matter.

"The warfare lasted longer than we know, save that it began with arrows and with swords, and ended finally with space ships and deadly rays.

"Tsoo-Ahs was the last great ruler of Ma-jhay-anhu. He saw that never could hope of the end come till the last member of one race or the other was wiped out. Both had airships now, so no colonies had been established, neither the Teff-Hellani nor the Ma-jhay-anhu had dared a small colony. But now Tsoo-Ahs sent thousands of young men and young women into all the corners of the world, hastily, for a plan had been made and it must be executed befor the Teff-Hellani learned of it.

"The expeditions set out—half equipped, uninstructed, without plan. And Tsoo-Ahs, who had invented two great things that were to make this thing possible, set to work. He had learned to extract the secret energy store of the indivisible particle. And he had learned to hurl the deadly ball of electric energy."

"Great glory! Tsoo-Ahs. Zeus!" exclaimed Spencer.

"Naturally. Sit down and shut up. Ever hear of Mu? That's what's left of Mahu. Ever hear of Easter Island, and the remains of the great city out in the middle of the Pacific? That's more of Mu—or Mahu. Now shut up and hear how come. Also hear how come Mayans built pyramids and the Egyptians built pyramids and the Babylonians or some race around there built a tower. And why the Greeks and other races kept showing and talking about human torsos on human bodies," said Aarn.

"TSOO-AHS sent messengers to all his kingdom to hold a great feast," Anto Rayl went on. "And while the feast was in progress, and there was great merrymaking, and all laws and restrictions were relaxed, for he knew that all must die, Tsoo-Ahs began his work. He had made five great ships of a wonderful new kind which needed no wings and could go beyond the air. And he sent them up over the great crevice that was the entrance to the kingdom of the Teff-Hellani.

"The ships began a bombardment which fused the rock and split it open. The great crevice spread more and more, and presently an army of the Teff-Hellani swarmed up, and an air fleet, but the army was annihilated and the air fleet blown out of the air, and the great crevice widened, and stretched

half a mile nearer to the blue-deep waters of the great sea.

"And just as the waters of the sea roared suddenly downward into the mouth of the great caverns, a ship shot out, a ship not unlike our own, and it spit forth a series of great torpedoes that shot forward and buried themselves in the sides of four of the ships of the Ma-jhay-anhu, and the four ships were destroyed.

"A fifth torpedo was fired, but the skillful ones aboard the remaining ship dodged it, and sent a lightning bolt toward the Teff-Hellani ship. The Teff-Hellani was forced to flee. His guns made no impression and the lightning balls pursued him. His torpedoes were exhausted, and now, so great a volume of water flowed down the mighty mouth to the sunken caverns, the ship could not reënter, but could only watch and attempt to stop the flow. It was hopeless.

"In an hour the world shook, and the vast continent of Mahu settled somewhat. Tsoo-Ahs had expected that, for he knew. Worlds are made of blocks, like many huge boats floating close together in water. When one block gets too heavy, it will sink. Mahu had been balanced. She was full of great caverns, but her rocks were very heavy. Then the caverns were filled with quintillions of tons of water, and Mahu grew heavy, and the great continent sank.

"She sank and sank, till only the tops of a few volcanoes protruded, and then the violent action that shook the whole world took place.

"And now, remember, there remained two ships capable of fighting in the emptiness beyond worlds, the ship of the Teff-Hellani, and the remaining ship of the Ma-jhay-anhu. Now the five ships of the Ma-jhay-anhu were intended to have carried the last load of colonists to the five great colonies, and they were to have been the means of communication, and they carried tools and supplies and seeds.

"But four were destroyed, and the fifth was busy—busy seeking that last ship of the Teff-Hellani.

"They got on the trail of that ship at last by means of an instrument whose nature we cannot understand, and they followed it, faster and faster—faster—and each was protected by a powerful force that hurled meteors from its path, a reversing of the effect of gravity.

"They engaged in battle, and the Teff-Hellani had the advantage because their shells would pierce the protective meteor shield and were attracted to their victim by some means, while the ball-lightning was not attracted, but tended to follow only a straight line, while the Teff-Hellani dodged about.

"Both were too busily engaged. Across the small expanse of that little planetary system they had chased and fought, and now an incredibly rugged and dark mass of matter—a broken fragment of a world—loomed before them. Both struck it.

"They were separated when they discovered themselves in this strange space. They each hoped the other was dead—destroyed. The space was too great. They could not locate themselves. Their ships were damaged, and each sought a planet.

"We know of eighty-seven planets which revolve about this sun. There are more. And each of those two ships landed on a different planet. The Teff-Hellani picked one nearer the sun—warmer. But they could not get the warmth they wanted before their ship would give out, for this system is too vast. So they chose the planet we know as Teff-el. Our forefathers chose the planet we know as Magya.

"The people were in a peculiar situation. They had started out to colonize, but not in such a place. They had expected many other people to aid them.

Fortunately there were both males and females in the ship, so that life should not die, but there were no teachers, no thinkers, and no mechanicians. They were able to make, when they had tools and power to work with, and supplies of metal and chemicals. But they did not know how to find those supplies. They had never had to.

"In a generation the ship was a temple where the children worshiped the knowledge of their forefathers of the old world blindly. Then, as generations passed, a stone temple was built about the now-ruined ship. Finally the stone temple crumbled from neglect, and the Magyans spread over their planet as savages, but never totally lost to knowledge, for the legends persisted. And gradually civilization roused itself once more and grew, and the legends were thought of only as foolish sayings, tales for children, and disregarded, the ancient ideas of gods and goddesses—superstition.

"TEN hundred millia ago a man crossed space. He went to the nearest of our four moons. Then he went to the outermost. A crude rocket device. Again the thing was done. Then a ship finally took off from the fourth moon and went to the nearest planet. It was to have taken a millia. The ship never returned, but another went. It did not return. The third did not. The fourth came back, its rockets exhausted, and three greater rockets close on its heels. It was a greatly improved model, or it would never have escaped as it did, nor lasted so long in the chase. Signals had preceded it, so there were half a dozen other rockets out to meet it, and the convoy drove off the rockets which had pursued across five hundred million miles of space.

"Fortunately the rockets which went out to rescue the hard-pressed interplanetary rocket were a new experimental type. They were very swift and very agile. The Tefflan rockets were equipped with guns. Our rockets had none, but one clever rocket-pilot had a man stand in the air lock with a space suit on and throw heavy crates and castings about.

"The pilot headed his rocket straight for the enemy, then just short of a crash he changed his course abruptly, the heavy castings smashed their way straight on and ruined the ship. The others tried the same thing. One ship was punctured and died. The others retired hastily.

"The returned rocket explorer, Harn Malto, told what had happened. The others had landed on Teff-el and been killed instantly. For the Tefflans had their ancient legends as we had ours, and they, too, had seen in the humans the hated enemy. Harn Malto saw in the Tefflans the hated enemy of legend.

"The legends revived. And war rockets were made instantly. Some wild terrorist shouted that the cities would be destroyed and only underground was it safe. A man by the name of Hero Shal arose. He made a device which would crumble rock—a peculiar slow-explosion torpedo. He could dig his way into the hardest rock with amazing speed. The thing exploded grain by grain, only one grain at a time, but all in less than a second. It shattered rock, and the stuff came out dust. He was of course accused of attempting to advertise his product.

"Six tiny Tefflan scout rockets dropped noiseless and lightless from the sky, and wiped out Mag-harun, our largest city, in thirty-five seconds. The scout ships were piloted by Tefflans who went uncomplaining to suicide. Each was a five-ton missile of metallic sodium, which exploded and cast the flaming, liquid metal all over the city. The entire city was a single sheet of flame in seconds. Thousands and tens of thousands died through fire; as many more were killed by the poisonous, con-

suming dust that rose from the burning sodium.

"It happened that Hero Shal had lived there and built his underground home there. He was unharmed and, when the blazing ruins cooled, walked out.

"In a month cities were drilling their way underground; war rockets were being equipped with the deadly Shal torpedoes. Nothing could stop them. Even to-day the mightiest battleship armor frequently falls before them if they are not torn loose in time."

"Was that what we saw used?" interrupted Aarn.

"Yes. Those first rockets carried small ones, propelled by compressed springs. When the Tefflans came again, they destroyed another city, but there were few people in it, for, thanks to the wonderful Shal-crumbling bombs, great underground cities had been dug. They were half a mile below the surface. We had descended even as the original Tefflan race.

"And our archæologists were seeking that ancient temple. Millias passed in unavailing search, while the rockets grew more and more deadly. Bases were established on the outer moons and fortified. They were our centers of defense. And at last a fleet of ten rockets set out for Teff-el. Each rocket carried a tiny scout rocket which was to do most of the fighting.

"That was the expedition of Tarnel Car. There followed expedition after expedition, and gradually the rockets improved.

"Then, only about one hundred years ago, the Tefflans found the remnants of their ancient flyer. They found also the remnants of its engine. The engine had been protected by the very nature of it, and still existed intact. The driving apparatus, the disks, existed also intact, and that was enough. They made one of the new ships. They attacked us when they had three completed, and they destroyed utterly the bases on our moons, they destroyed our fleet, and they tried to destroy our cities.

"But we made little scout cruisers that shot out of hidden holes in the ground at night, careened suddenly toward their huge armored battleships, and loosed a Shal torpedo. They had never learned the secret of the Shal torpedoes, have not yet. They destroy themselves, and are always destroyed in a damaged ship before it is abandoned.

"The Shal torpedoes at last were made large enough so they ate holes in the giant battleships. Then rocket drives were added to the torpedoes so they destroyed the armor and went on drilling through to the inside.

"Shal torpedoes loaded with poisons finally forced the Tefflans off the planet. They set up bases on our moons and began bombarding our cities. They were slowly eating their way inward when a Magyan discovered the secret of atomic energy independently. He was disappointed; it was not what he had hoped for. It has always annoyed us. We require, still, great amounts of fuel, though theory shows that an engine could be made which would require so little a single man could carry it."

"How do you do it?" interrupted Aarn once more.

'The atoms of two metals are mutually destructive in certain conditions. I cannot show you now. It would take too long. The destroyed atoms fly about at tremendous speeds in all directions, the various electrical charges blending in a sort of continuous flame.

"This process is carried on in the center of a great boiler filled with a liquid metal. The flying atom-parts are captured in the metal, stopped, and become only heat and gas. The heat boils the metal and runs turbines; the gas is exhausted into space. But we are still limited, because while there is a great deal of energy in the fuel, and it comes

off as rapidly as we wish, the electric generators are not capable of handling more than a certain load, and are heavy."

"Wouldn't water be better in your boilers than mercury? It isn't so terribly dense," suggested Spencer.

"No; it isn't dense and won't stop the flying ions," Aarn reminded him. "Besides it would be smashed to atoms, literally, and give you something besides steam. Mercury is already smashed to atoms. But continue your story."

"It is short, now," Anto Rayl said. "With atomic power we succeeded in repulsing the Tefflans. We discovered our own ship soon—the ancient one, and the ball-lightning device. Sadly, the Tefflans have learned that secret now. It will be so much longer before the last Tefflan is killed. If only the worlds were nearer that we might fight better and finish this!"

VIII.

"I THINK," said Spencer, "that we can tell you what became of the other part of your race—the part that remained behind. The colonists were in terrible condition, because now they had no means of acquiring tools, they had no supplies, they could not communicate, for their planes, I suppose, ran out of fuel quickly, and they had not carried sufficient apparatus to make more.

"They, too, lost their civilization. Now some of those colonists had settled in Europe as we call it to-day. They met there a race of terrible savages, short, squat men, incredibly ugly, cannibalistic. They called them 'ogres,' and the myths of that savage race exist still. We know them scientifically as Neanderthals. These ogres were afraid to attack grown men, but they stole children, and some women, but eventually through ages of fighting were wiped out, and civilization grew again.

"And a portion landed in Africa and started a colony in Egypt. There were natives already there, and the natives were not intelligent, so the colonists learned the language of the natives, since the natives were too stupid to learn their language. And the colonists declined through several generations, while dragging the natives out of the utter abyss of ignorance, and then all advanced slowly to a high civilization, till at length the blood of the colonists was overcome by the poorer blood of the many native strains, and the civilization vanished.

"And another group landed in America, and they found natives, as had those who landed in Egypt, and they followed a very similar process, and again the civilization died. In each case, when the blood of the old Ma-jhay-anhu was diluted, it won for a time, then died.

"What happened to the others, I cannot guess. Maybe they landed in India.

"But only the undiluted Ma-jhay-anhu blood lived to reach a civilization once more that endured fairly well.

"And now, Anto Rayl, we have come through the Wall of Naught to join you. We shall go back, but this now is your life, your space, and your world. We shall open up paths of commerce between the worlds, perhaps?" Spencer turned to Munro questioningly.

"Not till we learn how to find our own space," he answered. "That may require years of observation and calculation."

Anto Rayl looked at Munro with interest. "What you need exists, I believe," he said at length. "An old legend: the captain of that ancient Ma-jhay-anhu ship wanted to go back through, and he was a scientist, and he spent many years observing and calculating, and in the end learned what he needed to know. But he found that the ship was no longer capable of making the trip, for parts had decayed in

the more than thirty millia that had passed.

"And the Teff-Hellani were exploring and found our world, attacked suddenly, and wiped out half the colony, one of the two cities. And they landed and looted the city, and among the loot was the book of data, inscribed on plates of an alloy of three noble metals which would not rust or decay, nor would change with time, according to the legend. For the old captain was not dead. But he said that the Teff-Hellani scientists would not be able to go through any more than he, but that one day the plates would be recovered from the Teff-Hellani. 'The Plates of the Secret will be recovered, and the last of the Teff-Hellani will be destroyed by a great world.' Those are the words of his prophecy. I do not understand the meaning of the last. But if you need data, I am sure those stolen plates, which we have never troubled to recover, will contain it."

"We've got to get them," snapped Aarn. "It took that old captain nearly a lifetime, and we don't want to wait as long as that!"

"We're with you, Anto Rayl. Those Teff-Hellani might decide to try going back themselves, since we came through," said Spencer grimly.

THERE was a restlessness among the ships of the Magyan squadron, and the great battleships swung slowly around and headed off to one side, towing behind them the massive wreck of the Tefflan battleship. The cruisers swung into position around the monster ships, and the destroyers and smaller craft followed. Only Anto Rayl's ship remained in attendance. A cylinder electromagnet suddenly shot out from it, and fixed itself in the magnetic pole of the *Sunbeam*. Immediately a slight jerk, and the destroyer started off towing the *Sunbeam*.

Aarn grinned as he saw it. "Where's your planet, Anto Rayl?"

Anto Rayl pointed it out, and Aarn made some adjustments. Suddenly the electromagnet shied away, a half dozen instruments on the control panel changed abruptly, the destroyer slipped rapidly to one side, then behind—and held steady. But the spot of light that was Magya was suddenly shifting slowly and steadily.

A flash of light past the windows indicated the battle fleet as the *Sunbeam*, with the destroyer now in tow, swept past.

"By the Lords of Space! How fast are we going? Why was there no acceleration?" exclaimed Anto Rayl.

"I can't explain offhand, Anto Rayl. It depends on a question of the structure of space. We are going rapidly, and every atom of us was accelerated uniformly. This drive is not suitable to your great battleships—that is we can't install it in those already made, but we can install acceleration neutralizers, and if that space disk you talked about is what I think it is, we can get real speed out of those big fellows. Your people will have to make a lot of things for me," Aarn went on.

Ahead the planet Magya was looming larger, rapidly. And off to one side three moons showed. A dozen huge ships were swinging swiftly around the world to intercept them, and Aarn slowed. A light broke out on the destroyer, a bluish light that winked and trembled rapidly, then died into blackness. Instantly an answering light broke out on one ship below, and the squadron of the home guard swung into a ring formation, and picked up speed as the *Sunbeam* and its escort dropped slowly toward the planet.

The ships were four huge battleships, like those that had come to their rescue out in space, but surrounded by a perfect cloud of small ships, some little larger than torpedoes.

"What different ships does your navy consist of?" Aarn asked Anto Rayl.

"There are six main classes of fighting machines. The great battleships are first, weighing in the neighborhood of one million five hundred thousand tons.

"A battleship is almost indestructible. Even when blown completely in two, it is exceedingly dangerous, as it maintains maneuverability, and fighting power. They are armed with the lightning apparatus, one set for each engine. Great guns, with armor-piercing Shal shells; Shal torpedo tubes, gas guns, the induction beams, and every known weapon, in the greatest possible size.

"THE HEAVY battle cruisers come next. Did I say that at present we have a total of fifty-six serviceable battleships? Two are in the Ma-kanee base. That is on our fourth moon. They are being repaired after a battle with the Tefflani. Three more are under construction on the ways at Santoa. There are always three under construction. We are soon going to start manufacturing four, for a new steel process has made this increase possible. Also, we are now recovering all broken derelicts of space for their metal.

"Of the heavy battle cruisers we have a total of a hundred and five in condition. Twenty-three are in repair docks on Ma-nayo, the third moon. There was a heavy engagement recently that sent them there. The heavy cruisers weigh about five hundred thousand tons and are equipped with two sets of engines, smaller lightning apparatus, heavy accumulator banks, lighter guns, but numerous torpedo tubes. Their armor is two and a half feet thick, enough to stop heavy shells, but not capable of stopping torpedoes.

"They are half as powerful and a third as heavy as a battleship, so their movements are somewhat more rapid. They are very dangerous craft.

'The next are the light cruisers. We have a hundred and eight of them now in commission. They are much the same as the heavy cruisers, with lighter engines, lighter accumulators, and much lighter armor. Their task is to punish the destroyers.

"We have over five hundred and eighty destroyers, about five thousand scout ships, and about ten thousand spy ships. The destroyers carry a light ball-lightning apparatus."

"I've always read," said Carlisle, "of space fleets meeting with seven thousand battleships from here, and twenty thousand from there, and so on."

"Neglecting," said Spencer, "the fact that a battleship represents something like a hundred million credits in hard cash. It represents a year or more of hard work, over a million tons of steel and a lot of complex delicate apparatus, plus a population running into the thousands.

"How was it, Anto Rayl, that we were able to destroy that Tefflan battleship?"

Anto Rayl smiled, and Aarn was similing, too.

"The answer is," said the latter, "that we didn't, I suspect."

Anto Rayl nodded. "You didn't. But you hopelessly crippled it. They had already noticed our approach, and being so badly crippled, and expecting a further dose any minute, they left in haste. They didn't know your power was gone."

"It was," said Munro grimly. "It isn't now. I see we seem to have arrived."

They had been shooting over mountains and lakes, over a green world of plains and hills and great blackened, torn bare spots.

"Bombs," Anto Rayl explained. "Radio-active. It will be dead for a century."

Now they had reached the border of a great sea, where a huge mountain range seemed to run off into the water

in a series of islands. Their escort had taken the lead and was hovering over one of the islands now.

Suddenly Aarn gasped, for the tiny blazing blue sun and the deep violet sky were obscured by a mist that grew more and more dense, a rapidly rising, vapory cloud that swept up from the sea. In a minute the entire district was veiled in an impenetrable fog. Even the television was badly hampered, so badly it could show but a few hundred feet ahead as they followed closely the leading ship. Anto Rayl was silent, intently watching the screen.

THE DESTROYER ahead was making straight for the largest of the near-by islands. And as they neared it, a peninsula a quarter of a mile long slid silently out to sea and sank beneath the waves. A great metal-lined bore was revealed, and instantly the destroyer dropped into it. The *Sunbeam* was directly behind. That bore was an oval cylinder five hundred feet wide, and two thousand long, and extending down beyond sight, curving into the bowels of the planet.

The lighted bore was suddenly darkened by the settling of the great rocky lid back in place.

The tunnel had straightened out. Now, suddenly, they came upon a great factory, a huge, brightly lighted underground workshop. Gigantic forms were in construction off across the big pillared cavern.

"This is San-toa," said Anto at that moment. "We wish to show you our ships. You have shown us yours——"

Aarn laughed good-naturedly. "Haven't shown you anything," he replied.

Anto looked down at the shorter man in surprise. "Nothing?" he asked in surprise. "But surely we have seen the machinery?"

"You could not duplicate it. It is hidden within itself. But I will show you things which you must make. Those two new battleships—have them tear out the accumulators you have. I will give them a better kind. The type you are using we have had on Earth for many years, and this type is far better. Further, I must have a power ship built——"

Aarn Munro talked rapidly. He talked, in the end, to a hundred scientists of this world, Magya, and showed them a thousand things. And he gave them specifications. Then he talked to the space-force staff and showed them a greater source of power lay in the sun.

"To fight successfully, you need power. I will give you three things that can be installed in all your battleships; the accumulators, the so-called aggie coils, the magnetic atmosphere which renders the Shal torpedoes useless and stops the lightning balls, and the transpon beam, which will cut holes in battleships. To do this, the battleships must have a greater power supply. A fourth thing I may be able to install, an automatic acceleration neutralizer that will release your men of the strain of motion.

"The power supply will be obtained in this way: A series of four mother ships, with their thin walls, their huge accumulator volume, must be stripped at once, and the new type accumulator put in, and with it such apparatus as I shall show you. These ships will make the trip to the sun, faster than light, collect the needed energy, and return loaded. They can charge four battleships, eight heavy cruisers, or twelve light cruisers. That must be done for victory!"

To be continued.

INTO 1935

Here we are with some great stories—but without one which we can honestly call a "thought-variant." There are more coming—plenty more—but we couldn't pass by this list. They're all good. At least I think so.

And now in the new year, if we keep driving through, interesting new readers, our aim is to go twice-a-month.

Step-by-step—always step-by-step—building solidly, looking ahead, driving. We've awakened the whole field of science-fiction from the coma in which it rested in 1932 and early 1933. It has been a happy awakening with new interest, new writers here and there and a scintillating galaxy of great stories to remember in 1934.

1935 stretches ahead full of promise for greater things. We have been building carefully and well. All of us, thinking back, realize that. Star Ship Invincible would not likely have grown on the barren soil of 1933.

Slowly our old friends have been returning to their old loyalties. One by one we have heard from a widening circle of correspondents.

Some of you have suggested a science club. I don't agree, and here's why. There are many science clubs outside of magazines. Many magazines have clubs of thousands of members devoted chiefly to the sale of the magazine—although of course each member pays his bills for pins and gadgets.

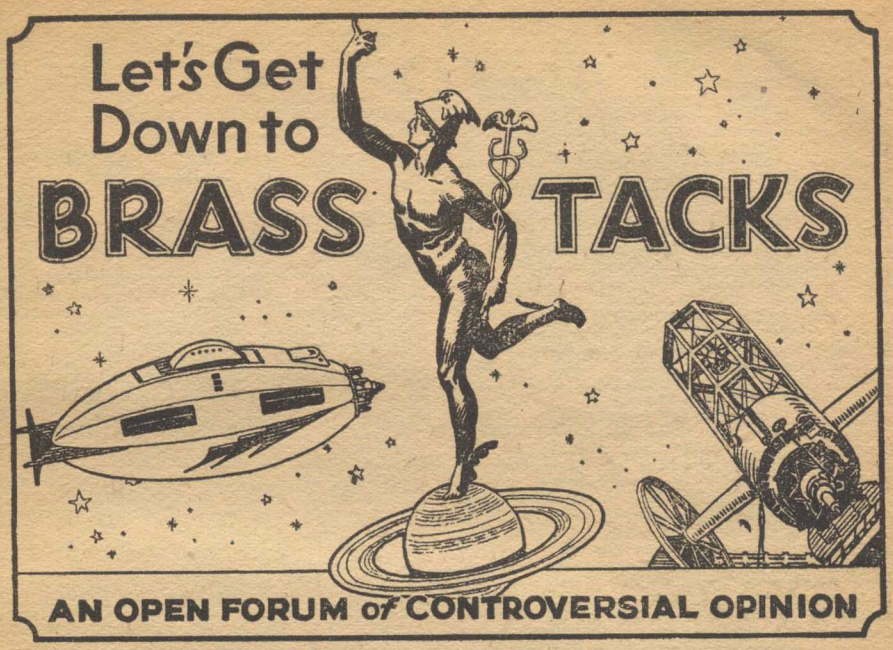
Somehow I feel that our audience is a little more mature than the type of mind whose loyalty is purchased by a gilt badge. I have felt that way for a long time. We seek relaxation from this world by soaring through the distant galaxies. We release our likes and dislikes heartily and freely by writing to Brass Tacks.

What I want to do is to devote our time to getting out a better and ever better magazine. That's what we want, isn't it? Most of us?

If we're going to work with authors for better plots and newer ideas we must keep driving—driving—driving! And it isn't hard when we see the results month after month into our new year—and once again into the new year.

Mistakes? It wouldn't be human not to make some, but I feel that we have made fewer as the months have rolled by—and as the politician remarks as he shouts for his new term in office: "Let's stand on the record!"

——The Editor.



Dr. Smith Comments

Dear Editor:

Although a lifelong and inveterate reader and collector of scientific and fantastic fiction, I usually contribute to discussions only when goaded to battle. The news that you are thinking seriously of going semi-monthly, however, has aroused me from my customary torpor sufficiently to account for this outburst of activity.

I am heartily in favor of a semi-monthly, and will support it with enthusiasm. I am also in favor of and will be a charter subscriber to a quarterly. And, along this same line, I check Mr. Wollheim and Mr. Cahendon to the usual nineteen decimals in urging a sister magazine specializing in wild-and-woolly adventure with a scientific or pseudo-scientific background. I got a terrific kick out of Hawk Carse, and the fact that there is now no place in print for Anthony Gilmore not only makes me sad, but makes me conscious of an aching void. In fact, I am heartily in favor of anything that will add to the supply of high-class fare for us fans; who, as you have already observed, form an association which, although limited in numbers, is perhaps the most compact, and is certainly the most loyal, most vociferous, and most critical group of readers ever known to the literature of any age. Nor need any one fear a depreciation in quality. You know that Astounding is the leader in its field: we should realize that you would not jeopardize that proud position by publishing additional magazines unless and until you are assured of championship material with which to fill them.

Now as to authors. Of the professionals, I rank Murray Leinster easily and definitely first. I have enjoyed his stuff for years, and want to acclaim him in this, my first letter to Brass Tacks. His short stories have a concentrated punch that makes the reader gasp like a fish; his longer tales are characterized by an originality of idea and a cogency of style that are refreshing indeed after the humdrum rehashes all too often served up by men who make writing their lifework. I realize, as he has said, that writing scientific fiction is really a form of dissipation—but I am very glad that he sometimes fails to resist temptation!

Of the younger set, you have (or will have shortly) the two of outstanding brilliance and promise in Campbell and Williamson. No ranking is intended—they are both good with a capital "G." Indeed, to paraphrase Kipling (in reverse), everything that has ever been said about those young men is true.

And last, but far from least, there is C. L. Moore. I read five of her stories without being impelled to rave. Good jobs they all were, and done in workmanlike fashion; but nothing calling for repeated reading. Then *The Bright Illusion!* Man, there is a job of work—adult fare, that; no fooling! I have read it three times so far, and haven't got it all yet. Personally, I do not agree with her basic thesis—I believe, as I have had my heroes say, that while a terrestrial might like, respect, or admire a denizen of another world, he could never love one of them—but this divergence of opinion in nowise detracts from my enjoyment and appreciation of a truly remarkable and really masterly piece of writing. I have no idea whether Miss (or Mrs.) Moore is a young girl with an unusually powerful mind and a full store of unsullied idealism, or whether she is a woman whose long and eventful life has shown her that real love is man's supreme dower. But whoever or whatever she may be, I perceive in her *Bright Illusion* a flame of sublimity brighter, whiter, fiercer, and more intense even than the eternal fire of IL's great temple.—Edward E. Smith, 33 Rippon Avenue, Hillsdale, Michigan.

Posies

Dear Editor:

Brass Tacks section in Astounding Stories is very interesting. Some of these tacks, a surprising lot of them, stand out handsomely gold plated, while quite a few seem solid gold. Until just now no variant thought has suggested that I offer my modest easy-chair brass tack for the collection. The same variant thought suggests, however, that I ought at least to make it pretty with a diamond inset, but it hasn't shown me how I can do that.

Anyhow, congratulations upon producing a magazine in which a fellow with thirty-five years' experience in scientific work can find pleasure and relaxation, and for your "thought-variants," which most certainly can set him to

thinking along new lines. The world to-day is full of inventions, discoveries, and knowledge the way to which was blazed by thought-variants of the past. And thought-variants of to-day and in the future are going to lead to many things of which we have as yet no practical conception. Add to a scientific background (I mean a basically sound foundation) imagination and the spirit of adventure, and a young fellow is equipped for a mental journey into the unknown. Give him in further addition the physical soundness of an air-transport pilot and his level-headed caution, a not too widely-swerving persistency, and a non-skidding fortitude, and his chances of arriving somewhere are doubled.

Far be it from me to offer complaints or criticism of the magazine. Personally, I'd buy it quicker if it had a different sort of name, and I'd like it better if what advertisements it contained were of a higher class. But the problems connected with the latter matter you know better than I, and a rose, no matter what you call it, smells just about the same. Besides, I couldn't suggest a better name.

I must put in a word for your artists. Scientific fiction illustration calls for special qualifications. It takes, besides art ability, an imagination approximating that of the author illustrated, a scientific and mechanical understanding and appreciation that will prevent the artist's work from being merely silly, and an unnamable quality that helps the reader to lose himself, for the time being, in the story. There has indeed been some of the work not so good as some other work by the same illustrator, but what of that? Nobody, either artist or author, can keep up to the mark invariably in work of this nature. So here is a bunch of pretty posies to distribute among your artists—and I hope you pay them splendidly in good, hard cash. I like plenty of illustrations in the stories I read. Incidentally I would remark that in science-fiction humor to me is only an irritant.—L. A. Watersmith, Gardiner, Montana.

First Letter

Dear Editor:

This is my first letter to any magazine, but I hope it will do to throw a few brickbats and also a few bouquets.

Lo! Rotten. I have never read (and I have read a lot) such a waste of good space as that serial (eight-part at that) is. It is concluded now and please do not print any more like it.

The Skylark of Valeron deserves all pats which it can be given. It surpasses all of Dr. Smith's stories. And that's saying a lot.

I like the idea of a semi-monthly magazine. I think that with the material you must have on hand and the material that you are constantly getting that you could get out two mags a month without letting them degenerate a bit.—George Richard, 819 West Gage Avenue, Los Angeles, California.

In Defense

Dear Editor:

I have just received the November, 1934, issue of Astounding Stories and, in reading the Brass Tacks department, have discovered a letter slamming Charles Fort's *Lo!*—a series of articles which I have enjoyed very much. The writer of the letter, Edward C. Love, classes *Lo!* as being "the worst written and the most utterly senseless" article that he has ever run up against. In fairness to Mr. Fort, deceased, I would like to say that *Lo!* is the most interesting collection of queer and unusual occurrences that I have ever read—and, so help me, that's not a lie. Mr. Fort must have spent a good number of years compiling material for his magnificent work. Imagine obtaining all sorts of periodicals, foreign included, in a search for unusual happenings! Imagine weaving these unusual happenings into an interesting, yet sensible, article! What a task that must have been! I believe that *Lo!* is the only article of its kind in existence. My hat goes off to Mr. Fort. I simply cannot understand why Mr. Love denounces *Lo!*—T. Lutwiniak, 172 Pavonia Avenue, Jersey City, New Jersey.

"Macro-marvels"

Dear Editor:

About *Lo!* which is now completed. Those last several instalments about a star-shell not too very far away, and a stationary earth—that has sure got me. Everybody thought the earth was flat, and it was round. Maybe everybody thinks the earth moves, and it doesn't move. I don't know about that. But when Fort called to attention that a comet is said to be gas, space is said to be ultra depth-degrees in temperature—that's a poser! It would look to me that either comets aren't gas, or space is lukewarm in comparison to what has been the usual consideration of it, or am I wrong, or what, and why didn't somebody notice such an apparent paradox before, or have they, and if so what's been done about it? From the publishing day of *Lo!* forward, I don't see how comets can be considered gas or gaseous, space to retain its quality of cold incomprehensible; or vice versa.

And next issue I understand the law of conservation of energy is tossed off so nicely that neither the author, the editors, nor several university professors can find a flaw in it! And you call these things only super-science? Why, super-science is only stupor-science to thought-variant ideas like the macro-marvels with which you fill your miraculous pages!—Forrest J. Ackerman, 530 Staples Avenue, San Francisco, California.

List

Dear Editor:

Complying with your request that the readers limit the words per letter, I will make this one short. I think this is a good idea, as it will give room for more letters per issue.

Best complete stories in order mentioned: *The Mole Pirate, Twilight, The Great Thirst, Outcasts, The Machine from Ganymede, Lost Planet, The Hormone.*

Best serial: *The Skylark of Valeron.*

The announcement of a sequel to *Colossus* is as big an announcement (to me at least) as the coming of the *Valeron* story.—A. F. Wiggins, 2418 Stout Street, Denver Colorado.

"I Back You Up"

Dear Editor:

November issue: *Skylark,* A plus; *Twilight,* A; *The Great Thirst,* A minus; *Outcasts,* B plus; *The Mole Pirate,* B; *Lost Planet,* B minus; *The Machine from Ganymede,* C; *The Hormone,* C; it's impossible to classify *Lo!* I can't make up my mind. Anyway, it shouldn't be classified with the stories.

Re Donald A. Wollheim's contribution to Brass Tacks, I am all for his idea with regard to a magazine featuring a complete novel each month along interplanetary lines, and a name such as *The Planeteer* couldn't be beat, unless you called it *Hawk Carse!* Anthony Gilmore, who wrote the series of four *Hawk Carse* stories was an author that appealed greatly to all the old Astounding readers. In fact, of all the novels and shorts that were printed in the old Astounding, *Hawk Carse* stories show a tend-

ency to stand above all of them, according to the repeated calls that have come for him.

You are seriously suggesting the idea of a semi-monthly Astounding, and I seriously back you up with the promise to buy it regularly if such a step is taken. Science-fiction has reached the point of popularity where it is not too reckless to have two issues of a magazine featuring it a month.—Paul Cahendon.

"By All Means——"

Dear Editor:

Twilight, that swell story by Don Stuart, takes the cake for the November issue. And it's only a short story, too. It has a delicate beauty that is seldom found in science-fiction.

The Skylark is also getting better and better. At first I didn't think so much of it but apparently he (Dr. Smith) is going to clear up that mystery about the chlorine planet. I'll have to wait till it is finished before I can tell what I really think of it, though, as parts of it aren't so hot.

I think that it's a very good idea to have an interplanetary number in addition to Astounding. However, I think it would be better to have *two* adventurers instead of one. Say a couple of pals or possibly brothers and have an adventure of one one month and an adventure of the other the next month. And then have an adventure of both combined once in a while. The reason I'm asking for this is that although I like Doc Savage, I haven't got to the place where I can always figure out in advance the identity of the master crooks.

By all means have Astounding a semi-monthly. —Lionel Dilbeck, 1834 Gold Street, Wichita, Kansas.

Mr. Daniel Defends Himself

Dear Editor:

Mr. Stuart crashes the headlines with his magnificent *Twilight*. I almost felt like crying during the sad tale, and could almost hear the forgetful humans singing their song. How about a sequel? I want to know if the "curious machine" was invented!

Once again the question of absolute freedom of thought is brought up by its worthy exponent. I feel I am called upon to further defend my point, but I wish to do so in as courteous a manner as possible. The first point I wish to bring up is about a letter by a well-known author in a previous issue. He stated the old policy formerly used by Astounding Stories of long ago, bringing up its many bad points. We all agree with him. Next, I wish to drag the editor into our little tete-a-tete, although it must necessarily be open, and again array my side with official aid. The present policy, as I vaguely comprehend it, is very easy on all authors, new and old alike, allowing great variation of thought. Only thus could Astounding Stories have risen to its present magnificent peak. Note carefully then, that the old Astounding cruelly held new authors in check, allowing only well-established writers to contribute to its pages, and then only under horrible restrictions. The present change has so opened the way, that we might say it *is* absolute freedom of thought. Then our point of controversy appears inconsequential.

But the modern Astounding Stories does have a trim policy, if I may be so bold, which will naturally put a ban on such stories as are called fantasy. Now! By my definition of fantasy I mean stories based on such superstitions as tales of living-dead, cemetery horrors, three-headed snakes, horses with human heads, and such trash. I have no normal liking for that type of wild imaginings. (I'll bet I catch it now!) I was referring to the entrance of that kind of fantasy when defining your absolute freedom of thought to myself. Have I made myself clear, or does your own definition include that fantasy?—T. R. Daniel, 232 Olive Street, Claremont, California.

"Extra Good This Time"

Dear Editor:

Well, I was wrong. *The Skylark* will not take first place in every issue. Believe it or not, but I gave it fourth place in the November issue. That is due partly to the fact that the complete stories were extra good this time and the fact that the fourth part of *Skylark* did not come up to the others. Heavy water made a good theme for a science-fiction story. Murray Leinster is an excellent story teller. *The Mole Pirate* was very interesting. *Twilight* is one of the best shorts you have published; an unforgettable story. The rest of the shorts were fine reading.

I would not like to see a science-fiction magazine modeled after Doc Savage and The Shadow come out. Once you've read one, you've read them all. One author cannot write a book-length novel month after month without getting stale.

The total number of science-fiction magazines has not yet reached the figure of 1851. Mr. Hasse must be including magazines that contained occasional science-fiction stories.—Jack Darrow, 4224 North Sawyer Avenue, Chicago, Illinois.

Ouch!

Dear Editor:

Of all the lousy, sloppy, putrid things a magazine ever published *Lo!* by Charles Fort, beats them all. It smells to heaven.

An editor who can get as good stories as the magazine has and then flops with this rubbish deserves a brickbat. Fort must be laughing up his sleeve at what jackasses some editors can be. No doubt he's preparing another pail of tripe right now, after seeing how you gulped down *Lo!*—I. B. Madd, Rochester, New York.

Request

Dear Editor:

I have been reading Astounding Stories for several years now, and I firmly believe you will make a better job of publishing it than the former owners.

I would like to get in touch with an American boy (an Astounding Stories reader) about fourteen or fifteen years of age, or if any reader knows one, would he please put him into communication with myself?

I would also like to trade magazines with any lad in the States.—Hugh Carswell, 6 Selina Street, Belfast, Northern Ireland.

We Hope So

Dear Editor:

Congratulations are in order for the November issue. *The Mole Pirate* and *The Great Thirst* were very good, but personally I am unable to wax enthusiastic about *The Skylark of Valeron*. It's just another story to me.

At first I couldn't find much sense in *Lo!* but with the last few instalments I began to get the drift, as it were. I found *Lo!* very interesting, but it seems to me that the evidence is mainly negative in character and has little tendency to prove anything at all. Such articles as this, however, enhance the value and interest of the

magazine and I hope that such articles will continue to be published.

I now have a request to make, and please consider it seriously. Surely you have enough material submitted to make possible the publishing of Astounding semi-monthly, without debasing its present standard of excellence. I always finish reading Astounding within twenty-four hours of the time of purchasing and the four other magazines I read regularly are woefully inadequate to the task of filling out the rest of the month; so twice-a-month, please.—R. H. Sheldon, 903 Emery Street, Fulton, New York.

Supersalesmanship

Dear Editor:

I, too, have been adding my humble bit in the great and praiseworthy work of introducing more people to Astounding Stories. I exercised my supersalesmanship on five chaps just this afternoon. But, as is not my wont, I claim not one iota of the honor. The November issue did the trick. Nice work, editor, keep those good stories coming in our direction and here's one reader who'll never complain.

Just one question of you and I shall crawl back into my hole only to come forth to get my copy of "our" magazine each third Wednesday. The question is in regard to Charles Fort's, *Lo!*

Why?—Donald H. Ward, 315 Florence Street, Houghton, Michigan.

We Shall

Dear Editor:

I have just completed reading the November issue of the Only Magazine and I want to congratulate you on that issue, as I think it's colossal.

In reading Mr. Donald A. Wollheim's letter I find that he has put into words one of my ideas namely, that of publishing a magazine using the interplanetary fields as the stamping grounds for adventure and romance. What have our other readers to say about this?

The Mole Pirate, by Murray Leinster, was superb—it was entirely different from anything I have read in a great while.

I have complied with your request. I have cornered two new readers. Astounding Stories is the best. Let's keep it better than the rest. —Paul Dean, 225 Roxbury Street, Clifton Forge, Virginia.

Tackling Fort

Dear Editor:

Well, *Lo!* is having its undesirable effect, as I long suspected it would. You cannot knock the scientific profession right and left whether in seriousness or joking without having several foolish followers.

Just to prove how easy it is to break down Fort's arguments, I'll tackle the one where he attempts to disprove the idea that the earth does revolve. In his characteristic manner, he calls upon deception to prove his point. He states that at great heights it is conceded that whatever air there is does not take part in the earth's motion. Then he goes on to prove that because clouds at such heights do not prove this motion, the earth does not revolve. Any region in the atmosphere high enough to support clouds certainly revolves right along with the earth and we, therefore, concede nothing to Mr. Fort or anybody else who uses newspapers for scientific proof. What really makes Mr. Fort look silly is that it can be proved that the earth does rotate by dropping a weight down a deep mine (it has been done, too). The weight always falls a little to the east and always strikes the east side of the mine, if it is deep enough, due to the velocity of a body being greater further away from the center of a *rotating* body. Enough said?

If any of the readers think that Fort has put forth some good arguments, mention it in your letters and I'll wager that some of our readers will take care of them rather handily.—Edward F. Gervais, 512 South Pennsylvania Avenue, Lansing, Michigan.

Please!

Dear Editor:

As I understand it, you are trying to gauge your readers' reactions to a twice-monthly Astounding Stories. May I earnestly urge you to take this step? It would be a worthwhile impetus to science-fiction, and I believe such a two-a-month magazine would be successful. Science-fiction fans are different than any others. While other reader groups would not particularly mind missing issues, a missing issue would be a major calamity to a science-fiction fan. He would buy every issue to come out on the two-a-month schedule, not merely one every month or so. That is why Astounding Stories fortnightly would be as big a success as the monthly. So trot out that two-a-monther!—S. L. Adessa, 18710 Wyoming Avenue, Hollis, Long Island, New York.

Praising Fort

Dear Editor:

After having read Astounding Stories intermittently since its beginning, I am at it again after a lapse of quite some time.

I did like the October and November issues, really. I liked all the tales, almost equally well. But, I must indeed compliment you on your good taste—perhaps I might well say *bravery*—in printing Mr. Fort's *Lo!* I wish to compliment the author! Evidently it didn't take so well with some readers—I notice it is generally ignored in favor of the other stories—some mention it only to condemn. But, surely, it should cause one to think! Surely we should always be open-minded! I never have been prone to accept without question the pronouncements of our worthy astronomers and other scientists. Is anything ever conclusively proved? Have not a myriad "proven facts" in the past been later disproved? How about Einstein and his shattering theories? Can we smugly ignore them?—D. V. Simpson, 137 South State Street, Marion, Ohio.

Oops!

Dear Editor:

Smith, Leinster, and Schachner! What a trio! What an issue! What a magazine! What a—oops! Pardon this sudden outburst, Mr. Editor, but if you knew how full my cup of joy is, I'm sure you would permit my rejoicing.

This issue, the November one, is absolutely the best that ever was put between the covers graced by the fair name of Astounding, and them thar's big words, pahdner.

I need not comment upon the stories, they speak for themselves. All you lack is a bi-monthly and a quarterly.—Irving Kosow, 3415 Fulton Street, Brooklyn, New York.

"A Niche Long Vacant"

Dear Editor:

Although I have read science-fiction steadily for the past three years, this is my first letter of comment to any science-fiction magazine. I wish to repeat first of all what you have heard

from countless other readers—that your magazine is the best on the market.

The thought-variants have ably filled a niche long vacant on the shelf of science-fiction. I believe that they represent science-fiction in its broadest interpretation; they are subsequently true indices of the trends of modern science-fiction. This is exemplified by *Inflexure* in the October issue, which represents the best treatment of the true concept of a fourth dimension that I have encountered to date. The only glaring fault I can find in Astounding Stories is the steady recurrence of *Lo!*

I would like to suggest that you publish voting blanks on which readers can express their opinions on the leading changes proposed by so many others.—Edward Hart, 140 Vermilyea Avenue, New York, N. Y.

Fightin' Mad

Dear Editor:

Hello, all you cranks and crabs who write in to Brass Tacks. You like plain talk? Well, here's a nice bunch of brickbats for you.

Point One. Those "rough edges, cut 'em straight" individuals, get this. Shakespeare would be Shakespeare even if it were printed on dirty shirt-tails! Harpers, Scribners, Atlantic Monthly, and Golden Book use the same type of paper and edges, so what?

Point Two. For the "when do we get a quarterly" kickers, get this. One issue of Astounding Stories has one novel, two novelettes, and four shorts, and in addition one GOOD serial and *Lo!* (whatever that is). Show me any quarterly science-fiction magazine with that much reading, and I'll eat the damned thing, wire staples and all.

Point Three. "Wire staples" kickers, get the following. Wire staples are cheap and effective. If you add an extra-long operation like stitching to a magazine, it would cost the publishers more to produce. If you want your copies printed on linen and stitched, you can buy 'em from "S. & S." but not for twenty cents. Less expense means a larger profit, a larger profit means more expensive stories.

Point Four. "The size of type" kickers. If you need glasses, for Pete's sake buy 'em. The type used by Astounding Stories now is standard magazine type. If you can find a telephone number without effort, your eyesight is excellent.

Point Five. "I don't like your cover" kickers. Boo! Mr. Brown is a good artist, careful with his color, lights, and shadows. His covers are quiet, attractive, and in good taste. Compare them with Paul's this month, or Morey's on the rival magazine's covers. Paul has a nice scarlet sky, green and yellow monsters, and a yellow ground. Morey has a green, purple, and yellow dinosaurus, with a liberal sprinkling of orange-purple mountains, red and yellow sky, and nice amateurish black outlines. Swell for circus posters! Ugh!

There is your plain talk. Now you bunch of armchair Einsteins and sofa-cushion Millikans, listen. Brass Tacks is a criticism department where editors look for intelligent criticism and suggestions. Not a place for a bunch of chronically dissatisfied old women to gossip behind their hands and air their theory of the universe and magazines in particular.

Mr. Jack Darrow's nice little kick on the number of words per page is significant. I wonder if it is the same Jack Darrow of the executive board of a society sponsored by one of Astounding's rivals. I notice that that particular magazine managed to state this month that it has more words per page than any other of its rivals. It has only four complete short stories and two serials this month. The remaining rival has two serials and only three shorts, compared to Astounding's one novel, two novelettes, four short stories, and one serial.

Think over what I have said so far. I stand ready to make a public apology to any one or anything I have falsely or viciously criticized.

I have no connections with Astounding Stories, and I don't care a hoot whether they publish this letter or not, but right is right. Some people can kick more over twenty cents than Henry Ford can kick over two million. If you don't like the magazine, don't buy it.

I just love nasty letters, so don't hesitate, boys! I wish the editor would turn over all the nasty letters to me, I'd answer each one in disgusting detail, and thrive on it. So beware, you scallywags, the minute I see an unfair letter in Brass Tacks, I'll write to the donor, even if he is in Africa.

Both last month's and this month's issues were up to their usual standard. However, I hope you don't suffer too much from *Lo!*—Hubert Allcock, 301 Willow Avenue, Lyndhurst, New Jersey.

A Campaign Suggestion

Dear Editor:

Now that Astounding Stories is universally recognized as the greatest science-fiction magazine ever published, how about a campaign for science-fiction movies?

Five months ago I couldn't see how your magazine could be improved. I still can't, but I know it will. One of Winchell's orchids to you, editor.—H. A. Egbert, 1827 East Albert Street, Philadelphia, Pennsylvania.

Rubber Staples And Doughnuts

Dear Editor:

Well, editor old kid, you won't reign long now. The good old SPWSSTFM is going so strong that I have been forced to hire six extra secretaries to handle the inflow of mail. It was (is) surprising to see how many people actually want the wire staples pulled out of Astounding!

Two officers have been elected in the SPWSSTFM so far. The first is Virginia M. Parker, of Merigold, Mississippi. She has the title of "Grand Gadzook." She also suggested substituting rubber staples, and she donated three cups of coffee and a doughnut to the cause, which makes her a "second-degree Grand Gadzook." The other officer is Leroy C. Bashore, of Lebanon, Pennsylvania. He joined early, and contributed a check for five thousand dollars and seven cents to be used for the cause. I haven't figured out what to do with the seven cents yet, but this generous contribution earns him the title of "Honorary Igwagig."

Right here the Society wants to go on record as being in favor of two other things. The first is twice-monthly publication of Astounding, and the other is a suggestion made by another fan. A small dime magazine, featuring The Planeteer or some such character. Now we have sense enough to see that we can't get such blessings by asking the editor. It's up to you, readers. The more you (and we) boost and help Astounding, the sooner we are going to see one or both of the above-mentioned blessings. The Society and myself are going to boost the magazine to the limit, so let's see some of you other mugs doing the same! Correspondents please notice new address.—Bob (Dictator) Tucker, 210 Grove Street, East, Bloomington, Illinois.

The Enterprising Greek

Dear Editor:

I agree with the minority of Astounding Stories readers in that I do not like *Lo!* Before I finished the story, I expected him to assert that the sun was a candle in the chariot of a Greek who was driving around the shell which is supposed, by Mr. Fort, to encircle the earth. I am glad that story is finished.

I am not in favor of Donald Wollheim's suggestion: That a dime magazine dealing with space travel be published by Street & Smith. It looks as if Astounding Stories will become bimonthly. This, in my opinion, is better than another magazine.—Ralph R. Schroeder, 1022 Eighth Avenue, S. E., Rochester, Minnesota.

Maybe Soon

Dear Editor:

I have been a reader of your magazine since way back when, but this is my first letter. I don't care whether or not you print this in Brass Tacks, as long as you heed my plea. When, oh when, are you going to give us a quarterly? Surely, by this time, you must know that the Astounding Stories fans are just pining for one. And couldn't you possibly make the magazine a semi-monthly? Please comply with at least one of these requests, I beg of you.

How about some of youse guys and gals writing to a feller once in a while, eh?—George Meyers, 6218 Peterson Avenue, Chicago, Illinois.

Wait Until You Read Age

Dear Editor:

I have been reading your magazine for a long time, simply because I find it diverting. Though I have a Ph.D., I have never been over-critical, but I do want to protest violently against Schachner's story, *The Great Thirst*. Any story you publish should be plausible and, if based on things known to us, those facts should be straight. For example, the idea of using electron guns on space-fliers is not so bad, but Mr. Schachner's shooting positrons and electrons through the earth's atmosphere is totally ridiculous, as no such stream of particles could pass through an appreciable distance without innumerable collisions with the molecules of the gases comprising the atmosphere. There are a few other things, but I'll be content to let it go after remarking that research chemists the world over would be somewhat astounded to hear that heavy water is unstable and decomposes in a day or two! I recommend that Mr. Schachner read some of the recent papers on collisions of positrons or deutrons with elements, rather than getting his dope from newspaper accounts.

Having started in this nasty vein, I add that I was about to insult Rexford for his letter, but am too overawed by the colossal impertinence of the man in criticizing the Michelson-Morley experiment without knowing what it was. Holy mackerel! As for Fort, he obviously had a screw loose, but his stuff is interesting, anyway.

Now, to take the edge off this, I must admit that Schachner writes darn good yarns usually. But this one was so bad I have a secret feeling I could do better myself.—Martin Fletcher, New London, Connecticut.

The Gunman Gets Us

Dear Editor:

Why don't you use that ballot idea suggested in the October issue and which I seconded? I'm sure it would save a lot of space for other things in letters, and also for more letters.

You say you could publish a semi-monthly and not let down on quantity or quality. How about it, then?

Mr. Love seems to have something wrong with his liver and is venting his bad feelings in Brass Tacks. I can't take issue with him on the *Skylark of Valeron* matter, as I'm waiting for all the parts before I read it. By the way, I said I was going to shoot you if you stretched it to more than four parts. Bang! Take that, you villain!—Arthur L. Widner, Jr., 79 Germain Avenue, Quincy, Massachusetts.

By Dold!

Dear Editor:

Just finished looking over your November issue, and I think it's great. Keep up the good work. The magazine is getting better and better month after month. I have a request I would like to make. I want a story by Elliot Dold. Here's my vote for a semi-monthly, and a quarterly. I have been a science-fiction reader for about six years, and Astounding Stories is the best ever. —Ben Dick, 1130 East 42nd Place, Chicago, Illinois.

And Another

Dear Editor:

The best thing you could do now is change Astounding Stories into a semi-monthly. At present, there are only three science-fiction magazines being published once a month, and these are hardly enough to satisfy the hunger of thousands of intelligent readers (science-fiction fans, in other words).

It makes me sad to note that Street & Smith, large concern that it is, only puts out one science-fiction publication. The only fiction worth while is science-fiction. It stimulates the imagination; it takes a person from ordinary, humdrum existence and puts him in other times, in other lands, in other systems; it helps one to understand and appreciate science, and it makes a person stop and marvel at the wonder that is Nature. Yet, in spite of all these benefits Street & Smith only puts out one such magazine and the news stands are filled with such trash as western, detective, gangster, and spicy stories! How come?—Charles Pizzano, 11 Winthrop Street, East Dedham, Massachusetts.

Fort Again

Dear Editor:

To a man of intelligence, Smith is highly entertaining, and Campbell promises to be. However, your space could be much more profitably utilized by omitting such pointless wanderings as *Lo!* Mr. Fort is evidently a poor, deluded soul who thinks himself right and the world wrong.—Robert Moe, 13 State Street, Schenectady, New York.

"The Best"

Dear Editor:

After reading the concluding chapter of *Lo!* I would say it is the best story ever written in a science-fiction magazine; nay, any magazine. I hope to see some more of Charles Fort's work, if possible.—John Doyle, 1840 Sedgwick Avenue, New York, N. Y.

Short-short

Dear Editor:

First note, I'll keep it short. *Twilight* perfect, sequel? Thought-variants all exceedingly good.

Wants: Clean-cut pages and covers—semi-monthly—Burroughs.

How about answers in Brass Tacks?—A. T. Hardison, care of Akron Rubber Company, 207 Central Avenue, Sarasota, Florida.

★

STRAIGHT FACTS FOR STRAIGHT THINKING

By Newton D. Baker

NEWTON D. BAKER, *CHAIRMAN*
NATIONAL CITIZENS COMMITTEE

1. It is true that billions are being spent by the Government in order that people may not die of cold and hunger.

2. But these billions, divided among the families in need, average for each family only about $24 a month.

3. And 70% of the free hospital services in the United States for the needy sick are provided by voluntarily supported hospitals. The sick among the unemployed number 48% more than among the employed.

4. Likewise public health nurses, also supported by your voluntary gifts, report that 66% of all their visits in 1933 were in homes unable to pay for the service rendered.

5. 30% more children have had to be removed from their own homes and cared for by voluntarily supported children's agencies.

6. Two-thirds of all the arrests for crime involve persons between the ages of 15 and 24 years. Millions of boys and girls living under conditions destructive to character need the character-building services of your recreation agencies.

7. A man may die of despair, as well as of hunger, for suicides, numbering 15,368 in 1928, grew to 20,927 in 1932. This shows that more and more people are ceasing to value the only kind of life they are able to attain.

8. America cannot be rebuilt by relief measures alone.

9. Your local community chest needs your support during this year of rebuilding human hope and morale. It supports hospitals, clinics, child-care organizations, character-building agencies and many other social services.

10. When you give in your city, you strengthen the forces of civilization in the neighborhood in which you live.

1934 MOBILIZATION FOR HUMAN NEEDS